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NAVAL PRIZE ESSAY.

(*Honourably Mentioned.*)

Subject:

"CONSIDERING THE CHANGES MADE IN NAVAL CONSTRUCTION DURING THE PAST TWENTY YEARS, AND IN VIEW OF THE EXPERIENCE GAINED DURING THE CHINO-JAPANESE AND SPANISH-AMERICAN WARS, WHAT ARE THE BEST TYPES OF WAR-VESSELS FOR THE BRITISH NAVY, INCLUDING ARMOUR, ARMAMENT, AND GENERAL EQUIPMENT FOR SHIPS OF ALL TYPES?"

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"*Toujours prêt.*"

CHAPTER I.

THE subject chosen for the Prize Essay of the closing year of this remarkable century is a very apt one. Of all the changes that have taken place during the century, where is one to compare with that of naval construction? The subject should be received with great satisfaction, especially amongst naval men, who, being forbidden to write to the Press on Service matters, have here a splendid opportunity to express their views. Where is the naval officer who cannot build a ship better than all the constructors of the Admiralty?

The criticism that is invoked by this subject should do more good than harm, provided it be without prejudice, and it would be difficult to write an essay on this subject conscientiously without freely criticising present and former construction. Naval officers and constructors are jointly responsible in building up the fleet, and one gets ideas from the other, so that it will be to the advantage of both to hear both sides of the questions at issue.

On such a purely professional subject, there is so much to be said that might be regarded as of a confidential nature, that one would have scruples enough to deter one from writing at all, were it not for the

conviction that the free expression of public opinion is the surest way towards advancement and reform, and that in the matter of educating the public mind, which the JOURNAL of the Royal United Service Institution undoubtedly does, for every foreigner that reads an article, there are at least a dozen Britons; and also, as the public are apt to force their ideas on the Government, it is well that the public should be educated.

In this essay I have often criticised our construction, without prejudice to those who have been instrumental in building up the first fleet of the world, and if I differ from them in any details my excuse must be that it is easy to be wise after the event. I have endeavoured to support my ideas by the opinions of experts, by reason and argument, and must ask the judges to consider, before deciding that any of these reasons are illogical or false, that there are two sides to every question, and that while studying the subject, together with the lessons of the late wars, I have sometimes had difficulty to decide, in the counts for and against, which was the better view to take, in the choice of the greater advantage or the lesser evil.

The types of ships which I propose to discuss in detail in this essay are those which I consider essential to a modern fleet, and include battle-ships, armoured cruisers, scouting cruisers, stationaires, torpedo craft, rams, training-ships, and fleet auxiliaries.

Until it is positively proved that for an equal outlay of money any other class of vessels can overcome battle-ships, we must not only continue to build them, but our numbers of them must be kept proportionately greater than those of our possible foes, as our trade and interests are proportionately greater than theirs. Battle-ships are the soundest insurance for our trade; for while we have a battle-fleet at large, an enemy could never undertake an over-sea expedition against us or our Colonies, without the risk of being cut off from their own country, which would probably mean the capitulation of their whole expedition. The value of battle-ships was proved at Yalu, when a Japanese fleet of modern cruisers, armed with modern Q.F. guns, pounded away all the afternoon at the "Ting Yuen" and "Chen Yuen" without being able to effect much damage. The "Ting Yuen" was afterwards sunk by a torpedo from a torpedo-boat in Wei-Hai-Wei roads (you can hardly call it a harbour), which, without depreciating the value of battle-ships, simply proves that torpedo-boats can make certain anchorages untenable for battle-ships in war, and Wei-Hai-Wei amongst them.

The relative value of battle-ships and armoured cruisers, to what extent armoured cruisers will be able to fight in line of battle, whether armoured cruisers will eventually supersede battle-ships altogether, are questions which time alone will prove. It is the question of the relative values of speed and fighting efficiency, which is one of the subsidiary points the naval manœuvres this year were designed to elucidate.

The battle-ships, then, constitute the main body of the fleet, which would be useless enough without its other members, just as the other members would be useless without the body. Whatever other ships we build for the fleet must be built for the purpose of supporting the main

body and rendering it more efficient. The cruisers represent the sense of feeling, in keeping in touch with the enemy and communicating intelligence to the body. Rams and destroyers are its weapons to launch at its enemy by day or night respectively, to disconcert, harass, and weary it before the final contest. Colliers and condensing-ships are its commissariat; repairing-ships its field hospital and ammunition train; training-ships replenish the wastage of its brains; stationaires are its sentinels or outposts. I do not agree with those who think that the individual ships of a fleet should be absolutely self-supporting. I do not see how it can be so, any more than the battalions of an army in the field. There is no doubt they should be self-supporting for the action of a day, but a close action may not be decided in a day, as in the case of the four days' battle in the Straits of Dover between the English and Dutch, 1st June to 4th June, 1666. A fleet with spare ammunition and facilities of repair at hand would be in a better position to renew the battle the following day.

It would require the pen of a Mahan, with his teachings from the naval history of centuries, to show that a fleet of ships of the line to seek out and destroy that of the enemy will alone give command of the sea, and should be the first consideration of every naval Power. This cardinal principle must be taken for granted, as the proof of it is altogether beyond the scope of this essay.

First of all, I propose to take the case of battle-ships as being the most important, and consider their armour, armament, and general equipment, and afterwards the other subsidiary forces which enhance the value of the battle-fleet.

Battle-Ships.

In considering the best form of design for a battle-ship, we must first take the ship as a unit of the fleet, and afterwards arrange each detail in construction to suit that unit.

To get the best results out of a fleet, it will be conceded that the ships must be of a similar size and speed, of equal radius of action and manœuvring powers, and of fairly equal powers of attack and defence; in other words, that the fleet should be of a homogeneous character. Having agreed to this principle, we must aim at making each new class a little better than its predecessor, embodying all the improvements in the various crafts which build up a big battle-ship.

There are different ways of getting to work. You can build a gun to burn a certain class of powder, or you can make a powder slow or quick burning to suit a gun; and so it is with a ship. You can lay down a given armament, and build a ship to carry it in addition to everything else you want, such as coal, ammunition, protection, powerful engines, etc., or you can design a ship of a certain tonnage, length, beam, draught, and dimensions generally, to steam a certain speed and distance, and then consider what she can carry in the matter of guns and protection: and, to my mind, the latter process is the most practical. By the former process, when you have built your ship to carry everything else you want to put into it, in addition to the guns, it is apt to reach such

terribly large dimensions that the armament is lost in the size of the target you present to your enemy. The success of the finished article lies in striking the golden mean between the guns, torpedoes, protection, coal, ammunition, and speed, which means size and weight of machinery, a slight balance being in favour of the guns, the whole ship being designed to carry them, and the number and weight of them being so vitally important in the first half hour of the battle. It is a point of honour amongst naval officers to fight a ship of their own ship's size. What is the use of being able to overhaul an enemy, to be destroyed by a heavier armament when you catch him up? If you get the highest possible speed out of a battle-ship, it is at the expense of armour, guns, or ammunition. So with a gun; if you abnormally develop the velocity, it is at the expense of the bore, at the expense of its life.

In considering the size of each new class, it is well to remember that in the fight between guns and armour, the guns that can be carried by a ship of a given size can pierce the armour at close range that can be worn by a ship of equal size; and therefore it is best, provided you can afford it, to look round for your most possible foe, and go one better by building the units of your squadrons a little larger than his, especially as the larger ships have many other advantages, such as increased radius of action, steadier gun platforms, etc.

Next comes the type, still keeping the squadron in view of which the ship is but a unit. Since the days of the "Warrior" (1859) we have pursued a most vacillating policy with regard to the types of our battle-ships; the whole construction has resolved itself into a battle between armoured and unarmoured ends. The "Warrior" had unarmoured ends, her broadside being protected 213 feet. Then we went in for broadside armour fore and aft as in the "Minotaur" class (1861). From 1863 to 1873 we built ships with complete belts and central batteries or turrets; 1874 marked our reversion to unarmoured ends in the "Northampton" and "Inflexible." Unarmoured ends then remained masters of the situation for over twenty years.

The sinking of the "Victoria" proved an unarmoured ender could sink a battle-ship, but it did not prove that an armoured ender would not have done the job much neater, for in getting through the "Victoria" the "Camperdown" encountered an armoured deck, which just broke the rind of her stempiece, and cut into her like a knife into a cheese. The "Camperdown" was very severely mauled by this armoured deck, when one considers that she started at seven and a half knots and lost some of it in the turn, that she reversed when the collision was inevitable, and was not probably going more than four knots when she struck, and the result was that a small piece was put on the bows of the "Majestic" class, and after due consideration a larger piece was put on the bows of the "Goliath" class, and unarmoured ends received a fatal blow in the new "Irresistible" and "Duncan" classes, when the patch on the bows of the "Goliath" was carried aft to meet the armoured belt.

Being the first naval Power we have been followed religiously in our vagaries of construction by all other Powers of any naval importance

except France; she alone has marked out a course of complete belts and stuck to it, although at times every other Power has been building unarmoured enders. In 1868 Germany built the "König Wilhelm" complete belt; 1877 to 1880 the "Baden" class unarmoured ends; 1884 to 1893 "Siegfried" and "Brandenburg" classes armoured ends; 1894 to 1895 "Odin" class unarmoured ends; 1896 to 1897 "Kaiser Friedrich" and "Kaiser Wilhelm" belted. The United States built complete belted monitors 1862 to 1890, and then followed us in unarmoured ended battle-ships, but have now come back to belts in the "Alabama" and "Maine" classes. The Italians built ships with complete belts 1863 to 1865, and then unarmoured ends until the "Ammiraglio di Saint Bon" and "Emanuele Filiberto" in 1897. From 1863 to 1890 the Russians built armoured enders, when they came round and have built unarmoured enders since, but have not yet made up their minds. As the Japanese get most of their battle-ships from us, it is only natural that they should be very similar to ours. Those now building for them at Elswick and Barrow have complete belts, nine inches amidships, tapering to four inches forward and aft, which I think is about right.

Our "Duncan" class are an acknowledgment that the French have been right in this respect and we wrong for twenty-five years. Either we have been led astray by the irresponsible writings of men who pretend to prove, by individual or unequal actions, that ramming has always been as dangerous to the rammer as to the rammed, or else our ships have been constructed for their individual powers, where tactics and strategy have been ignored. When a possible enemy's fleet is altogether composed of ships built for ramming, with the armour belt in every case extending into the ram, it is folly to say that battle-ships are not meant to ram, or that no admiral would risk his fleet ramming against ships with torpedoes. The ram is a thing which may be forced upon one. What, I ask any unarmoured ender, is a British admiral going to do if, with his fleet of unarmoured enders, he meets such an enemy's fleet, which persistently keep their rams towards him? Is he going to run away, or is he going to receive them on the point of his unarmoured end? If he does the former, the enemy will soon collect his stragglers; and if he does the latter, he will crumple up his bows. Given the guns and torpedoes as equal, the victory will rest with the ram.

There is a good principle which was laid down for boat sailing some years ago by a captain, now an admiral, in the Navy—that if you think you can win a race, you must stick to the boat in it you most fear; and, on the other hand, if you know there is a boat in the race that can beat you, it is best to try and get away on another tack, in the hope that a slant of wind may bring you home. This principle applies equally to a battle-ship, and therefore while the French were building a fleet of rams it was folly to neglect them.

To design the most efficient ram, we must consider what it has to contend against. Its worst enemy is an armoured deck; and the best means of overcoming this seems to be to break it up from below. Therefore the point of the ram should be deep enough to get in under the

sloping sides of the armoured deck, and the angle of the stem such as to prise it up. It has also to overcome side armour, which is not so dangerous, being more easily crushed in. That an unarmoured end is not proof against an armoured deck was proved in the "Camperdown," and sooner or later, I think, it will be shown that a battle-ship with a well-constructed ram can sink a ship with armoured deck and side armour without material injury to itself. In the collision which occurred on the 28th May, 1898, between the British steam-ship "Foscolio" and the United States cruiser "Columbia," the former struck the latter abreast the main-mast on the starboard side, and made a hole six feet wide, extending five feet below the water-line. The "Columbia's" armoured deck of 4-inch steel was bent backward nearly double by the collision with an unarmoured vessel, which looks as if an armoured ram would almost have cut her in two.

One argument against the armoured ram is that there is not sufficient flotation in the narrow end of the ship to sustain the necessary thickness of armour to make ramming practicable without great injury to the rammer. The obvious answer to this argument is that it is not necessary to carry great weight or thickness of armour forward to make an efficient ram, provided it is scientifically constructed. The primary object being to plough up the enemy's armoured deck, the ram must be constructed to this end. The plates on the bows must be thick enough and of the hardest steel to prevent being torn, as in the "Camperdown"; it must be supported by the armoured deck, taken to the point where it is most likely to encounter the enemy's armoured deck; also by a deck below, and very strong bulkheads, and frames close together. The bows being divided into a large number of small compartments, in addition to giving great strength and preserving the contour of the bows when ramming, will allow very little water to find its way into the ship. Another argument is that the armoured ram can only be constructed at the expense of armour on the citadel, and the answer to this is, that the saving of weight by the reduction of 10 feet in the height of the after-barbette in some of our ships would give sufficient material to put 4-inch plating on the bows. Also the introduction of Krupp hardened steel and sloping armoured decks has made it possible to considerably reduce the thickness on the sides.

The principal considerations for the shape of the hull of the battle-ship are steadiness of gun-platform, speed, draught, manœuvring powers, and target presented to the enemy. For gun-platform we must have beam, and good deep bilge keels, both of which are against speed. Some steam-ship lines build their vessels without bilge keels for the purpose of obtaining half a knot extra speed; it was once my misfortune to travel across the Atlantic in one of these ships. She rolled so abominably all the way for no apparent reason, that the passengers nicknamed her the steam-roller, and it was said that another vessel in the same line could roll even more without capsizing; her nickname was the Atlantic roller.

Lord Kelvin has told us that for a torpedo-boat 125 feet long and 51 tons displacement, steaming 20 knots, the skin resistance is about equal to the wave-making resistance; while for a vessel 300 feet long, 46·3 feet beam, and 3,626 tons, with no parallel middle body, with lines swelling out gradually, at 13 knots the skin resistance is more than double the wave-making resistance. Therefore, bilge keels must to some extent influence the speed of the ship. Now there is as much skin resistance in a bilge keel 150 feet long and 1 foot deep as in one of 50 feet long and 3 feet deep; but the latter, with the leverage on the water clear of the ship, will make her twice as steady. The French have found it out, some of their ships having much shorter and deeper bilge keels than ours. It means wider dock accommodation, which, of course, is a consideration.

For speed we must have draught, good steam lines, and a smooth surface. The late Mr. William Froude's tank experiments at Torquay and Haslar have effected great changes and improvements in the lines of our ships, and no doubt the new experimental tank, 500 feet long, which has just been completed in the Navy Yard at Washington, will enlarge our knowledge on the subject. This new American tank, having a bridge on rollers, driven by electricity, capable of towing models 20 feet long at a speed of 20 knots, is a great improvement on anything this side of the water; the American models being about five times the size of those generally used in Europe. The smoothness of the surface of the bottom is only next in importance to the stream lines, and if a chemist could invent and patent a lasting anti-fouling composition he would realise a great fortune. The bottom of a tug in America has lately been electro-plated, and if the experiment is successful it may be in some degree a solution to two vexed questions.

As to the manœuvring powers, those of our war-ships which steam best are often the worst at turning. The "Venus" class cannot turn in the wake of a battle-ship, and the "Terrible" nearly gets over the horizon with it. The whole secret of turning is the shape of the bows and stern combined with light draught and a good big balanced rudder; the stern of the ship should be cut up like a destroyer, and when you have come to the necessary depth for the point of the ram, the stem should go straight to meet the keel below the swell of the bow, the buoyancy gained in the narrow stems below water, without what might be called the deadwood cut away, being very little, and the turning powers are greatly impaired thereby.

As to the target presented to the enemy, the foremost gun position must of necessity be on a high forecastle, it having been clearly demonstrated for many years that ships with low freeboard forward cannot steam against a heavy head sea or fight their guns forward in bad weather; but this does not apply to the after barbette or turret, and the only conceivable reason why this should be at such a height as it is in the "Majestic" and other classes is to give accommodation, and certainly the cabins in these ships are palatial; but when it is considered that this is done at the expense of great weight of armour on the after barbette,

of increased exposure of ammunition hoists, of stability, besides offering a very much larger target for the enemy's shells to explode in, most people will agree that those after barbettes should be taken down a peg. Other considerations are the questions of sheathing, sub-division, and the use of inflammable materials.

The sheathing of ships involves a considerable increase of tonnage and expense. It costs £40,000 to sheath an armoured cruiser like the "Powerful." For this we have an initial speed of half a knot less, which, however, means two to three knots more when the ship has been nine months out of dock. Some of the extra money for sheathing is recovered in docking expenses saved. The "Renown's" performance of crossing the Atlantic at fifteen knots with a blade off one propeller was a remarkable one. The "Renown" had not been docked for two years, although she may have been in the fresh water at Quebec, which to some extent would answer the purpose. Such records point to the wisdom of the Admiralty in sheathing those ships which are required for service on foreign stations where docking accommodation is limited. It would be absurd to sheath every ship for the Mediterranean, for instance, where every ship can be docked regularly every six months.

On account of the introduction of the gyroscope, torpedoes can now be fired with much greater precision, and therefore too much attention cannot be given to the sub-division of the hull into a larger number of water-tight compartments of fairly equal areas. With these, together with a cellular double bottom extending over the greater length of the ship, and a large number of cofferdams and small compartments above the armoured deck, and behind the belt armour, a ship should take a lot of sinking.

Necessity is the mother of invention. As soon as one inventor brings out a net, another invents a cutter to make a way for the torpedo through it; and when the nets can no longer resist the cutters, they will become an encumbrance to the ship. With a more complete system of supervision and engines in three compartments, we may eventually be able to discard the nets and all their paraphernalia. At their best, nets can only be used in harbour, or in a calm at sea, and in harbour the fleet would have its outposts in the shape of destroyers and small cruisers to sink the enemy's torpedo-vessels, or give notice to the main body, before they get within striking distance of the fleet.

With regard to the use of inflammable materials in construction, the fires on board the Chinese and Japanese ships at Yalu, and those of the Spanish ships at Manilla and Santiago, have taught us that inflammable materials must be abolished in the construction of war-ships. It is a significant fact that the Americans, who have had this most important lesson forced upon them, so to speak, have realised the gravity of the situation, and ordered twenty-seven of their ships to be taken in hand and fitted with non-inflammable materials. This means about a third of their Navy. Were we to do the same, it would mean over a hundred ships. The American Board of Examination on Wrecks after Santiago reported that "the use of wood in the construction and equipment of

war-ships should be reduced to the utmost minimum possible"; that "all water and steam-piping should be led between the protection decks or below the water-line, and fitted with risers at such points as may be considered necessary." All cabins, chart-houses, bridges, boats, etc., might well be of steel.

Chapter II.

Battle-Ships—Armour and Armament.

These two components are so closely allied that they must be included in the same chapter.

With regard to the disposal of armament, Brassey tells us that in 1888 the Board of Admiralty, discussing the plans for the "Royal Sovereign" class, came to the following conclusions:—

1. That there should be four heavy guns placed in two protected stations situated a considerable distance apart, each pair of guns having an arc of training of 260 inches, equally divided on each side of the line of keel.
2. That the greater portion of the auxiliary armament should be placed in a long central battery, situated between the two heavy gun stations, and so disposed that there should be practically no interference with the fire of any one gun by that of any other.
3. That in view of the development of high explosives, it was desirable to secure the widest possible distribution of the guns in the auxiliary armament, and that it was preferable to mount the auxiliary armament on two decks, one of them being the spar deck, rather than to carry the guns chiefly between decks.

It must be gratifying to the officers who adopted these resolutions to see that they have been pretty widely copied by nearly all other battle-ship building nations, while the French, at the present time, are removing the midship heavy guns from those of their ships which have three mounted in the middle line, and putting a Q.F. central battery in their place.

Amongst the battle-ship building nations a certain fixed manner in mounting the armament is becoming recognised, more so now than at any time during the last twenty years, and this manner embraces the above resolutions, with the exception that, in view of the damage caused by high explosives on unprotected batteries, it is now thought more desirable to place the main auxiliary armament behind side armour, which has been made more feasible by Krupp's process of hardening steel.

Let us consider the protection of the vitals; we have placed them below the water-line and covered them up with an armoured deck. Under these conditions, in the calm water of a harbour, a ship should be well-nigh unsinkable; but at sea the case is different. Ships roll their armoured deck and belt out of the water, and if an enemy at that moment got one in under the belt there would be no "coming up to time."

It may be said that actions will generally be fought in moderate weather, and in moderate weather a battle-ship may roll 10°, therefore we may say that the belt which rests on the dip of the armoured deck should go to that point which would be on the water-line if the ship had a roll of 10° to the opposite side; this would represent about seven feet below the water in one of our first-class battle-ships. To my mind, the angle of the dip and the thickness of the sides of the armoured deck should be determined by experiment, in conjunction with the plates on the sides, using such armour on the side as would break the point of a 12-inch projectile before it met with the slopes of the armoured deck.

Who shall decide what is the best way to armour a battle-ship without the experience of a modern battle-ship action? One designer says we must have sixteen inches to protect this turret or barbette; another, we must have sixteen inches to protect the engines and boilers; but all these great thicknesses must be at the expense of something else. If you put sixteen inches round the engines you have nothing left for the bows, and about five minutes would do for the unarmoured bow opposed to Q.F. guns and high explosives in a close action. When every revolution of the screw will fill your bows more full of water, what ship could steam or steer? It is not so long ago that one of our cruisers, out on trial, took some hundreds of tons of water on board through her hawsepipes, almost endangering the vessel. Then there is a vast amount of difference in the penetration of a projectile according to the age of the gun and the powder; *à propos* of which, during the late revolution in Crete, a body of Moslems attacked the monastery of Angarathos, in the province of Candia; after cutting up the pictures in the church and generally making hay in true Moslem fashion, they stood in the doorway ten paces off, and took pot shots at the picture of the Crucifixion painted on wood half an inch thick. The wood being hard, and their powder old, their bullets did little more than make indentations on the surface. The monks of the convent now produce this picture as a miraculous triumph of the Christian faith, which would not allow a picture of the Christ to be penetrated by a Moslem bullet. The bullet marks showed that they had been fired from a good-sized weapon. Then also the penetration at one hundred and two thousand yards is very different. Yalu was fought about the latter range, and not a single projectile of the six 32-centimetre guns of the Japanese penetrated the 12 to 14-inch compound armour of the two Chinese iron-clads. Then there is a great difference in the effect upon a plate at every inclination to the vertical. A projectile which will go clean through a Krupp plate at right angles may be pulverised by striking it 15° away from the vertical to the plane of the plate.

Taking all these things into consideration, the best protection for the vitals of a ship of the line seems to me to be the slope of the armoured deck, and after this, guns, water-line, rams, bows, should all be taken into account, and a proportionate amount of armour allotted to each. What is the use of an impregnable redoubt when the unarmoured end is knocked away, and the ship is down by the bows, having lost her manœuvring powers, if not her stability? At a meeting of the Institution of Naval

Architects, some ten years ago, Sir Edward Reed, discussing the proposed plans for the "Royal Sovereign" class, said the first consideration in building such vessels should be to keep them afloat in the face of any fire which might be brought against them, and they should be of such construction that the small armaments of the enemy should never be able to destroy them—he would do nothing which would sanction the application of public money, and the risking of the lives of officers and men, in connection with ships which were not provided with the fundamental quality of being able to keep afloat; decadence began when the Admiralty turned out the "Inflexible."

In August, 1888, the Board of Admiralty, discussing the same designs, agreed that the armour belt should be in the same proportion to the total length of the ships as the "Trafalgar's," and in November of the same year there was another meeting of the Board, to which four admirals who had lately commanded squadrons were invited, to discuss further these designs. "To the question, 'Was it desirable to carry on the belt to the stem and stern instead of having unarmoured ends?'—it was generally agreed that when the belt was carried over such a large portion of the length of the ship as in the designs under consideration, so that the spaces above the protective deck, before and abaft the belt, were of small capacity, and the entry of water to them would produce only small sinkage and very moderate change of trim, it was preferable to dispose the weight available for water-line protection in the form of thicker armour in the belt not carried to the ends."

"To the question of fitting thin armour over the bows to prevent the end being riddled by light guns and the possibility of large quantities of water being admitted thereby, it was agreed that if such armour were fitted at all, it should be carried to a considerable height above the water-line, which would involve a considerable additional weight, and it was preferable if any weight were disposable for increasing the thickness of armour to utilise it in increasing the thickness of the armour on the broadside from the belt up to the main deck, rather than to dispose of it in the form of protection to the unarmoured bow."

At the Institution of Naval Architects the following year, Sir William White said:—"I would submit that it is for the naval architect to prepare alternative plans, showing possible dispositions of the protective material within the limits of the weight available in the design. Having done this, it is not his province, but that of the naval officers', to determine, from their knowledge of gunnery, what are the nature and extent of damages likely to be done in action, and to choose that disposition of armour which they consider has the balance of advantage."

Having always been of opinion that the unarmoured bow was wrong, I have taken these quotations from the "Naval Annual" in order to show under what policy the mistake was made. Perhaps, if the voice of the younger generation had been heard on that occasion, we should not now possess so many new ships with unarmoured ends. Of course the destructive effect of high explosives from Q.F. guns upon the unprotected parts of war-ships was not fully appreciated at that time. That has been brought to our notice to an extraordinary degree by the two late wars.

Having considered the evil of our ways, let us consider the remedy. Let us get out of the groove and take a lesson from our American cousins, who say what sized ships they require, giving speed and radius of action, give the contractor who has to build them a freer hand, and let him submit designs.

The Engineer-in-Chief of the United States Navy, in his annual report, says:—"If builders submit plans containing features superior to any of those in the department, it would be foolish not to adopt them, but, in my judgment, the adoption should consist of a modification of the department plans to that extent so that all builders should have to follow them."

Here I think we have the solution in a nutshell. In calling for tenders for a contract-built ship, the department apparently give the preference to the best design, reserving to themselves the right to embody any new features in that design in any future vessels they build or order to be built by contract—which is only fair. A private firm has no power to prevent a foreign country copying their designs immediately their vessels are passed over to them, so why should they object to being copied by their own Admiralty? They ought to be flattered.

We have decided that the armament of a battle-ship shall consist of heavy guns for piercing armour, a battery of Q.F. guns for attacking the weak spots in our adversaries, and a battery of light Q.F. guns for resisting torpedo attack. These three components of the armament are the outcome of all experience since the days of armour, unarmoured ends, and torpedoes.

As to the disposition and mounting of these guns, there is much more to be said. For the heavy guns it is a case of turrets *versus* barbettes, the superiority of which will only be decided by a close action. A turret weighing 500 tons takes some revolving, while plain barbettes, as in the "Royal Sovereign" class, give poor protection to the guns; a 6-inch shell striking one of the bands would put the gun out of action. Guns protected by a glacis shield, revolving on a turn-table, with mounting and mechanism within a fixed redoubt, seem to be the best compromise. Alternative hand, hydraulic, and electric gear should be fitted as in the turrets of the "Asama." At Yalu a fragment of a shell striking a hydraulic pipe put the "Matsushima's" 32-centimetre gun out of action, and this is sure to happen in many barbettes and turrets in a heavy general action. The Americans reported most favourably of the efficiency of the electric gear during the battle of Manilla Bay.

For the quick-firing battery we have to choose between armoured batteries, armoured casemates, turrets, or shields. It has been said that for one 6-inch gun in a casemate you can have two with shields, with equal ammunition supply, and that a gunner behind a shielded gun on the upper deck can make much better shooting than from the inside of a casemate, where, perhaps, he gets but an imperfect view of the enemy; but shields, I think, are shell traps, and the shielded gun unprotected by side armour will soon be upset. When the shield on one side of the ship is keeping off small projectiles, that on the opposite side is spreading

a net to catch them. The "Naval Annual" says:—"At Yalu the Chinese got rid of some of their shields, while some not fitted with the elastic attachment dropped from their securing bolts on the deck and prevented the guns from training"; while Lieutenant Ellicott, United States Navy, in his report to the American Intelligence Department from Manilla, says that "gun shields are no protection, and only mean the annihilation of the guns' crews if the shield is struck." But we are dealing here with the secondary battery of a battle-ship. The principal object of shields, which is only armouring the gun instead of the side of the ship, is to gain in weight so as to have more guns; but if you mounted twice as many Q.F. guns with shields than you could afford to put in an armoured battery, there would be great difficulties in keeping them supplied with ammunition.

Another object of shields is to obtain a greater angle of fire; and this also applies to turrets. Ships like the "Carnot" and "Iowa" get 180° on the broadside, which is not an unmixed blessing. Secretary Long's annual report says:—"The casualties on the American side on the 3rd July off Santiago, when Cervera endeavoured to escape, were one killed and ten wounded, most from the drums of their ears being seriously injured by the men having unwittingly placed themselves in the line of concussion of their own guns"—which was a departmental way of putting it; and no doubt some of the American naval officers would say some of the guns were unwittingly placed in such a position that the crews were before the line of concussion of other guns. This is the great objection of the French system of placing guns in turrets to fire right forward and right aft. Turrets also involve a lot of extra mechanism even when they are worked by hand.

It has been the practice of late to put our 6-inch Q.F. guns in armoured casemates, with 6-inch armour on the outside and 2-inch at the back. There is no armour on the side of some ships between these casemates, and this, I contend, is a very dangerous practice, a snare, and a delusion; for in fleet actions there may probably be enemies on either hand; and even if there are not, the men must be standing to the guns on both sides, in case of turning and bringing the opposite guns to bear on the enemy. A shell may come through the skin-plating between the casemates, penetrate the 2-inch back of the casemate the opposite side of the deck, be unable to get through the 6-inch Krupp steel on the outside thereof, burst, and kill every man in that casemate. Like the shields, one keeps the shell out and the other keeps the shell in. On this point I am entirely in accord with the writers of the chapter on recent war-ship construction in this year's "Naval Annual." To put 6-inch armour all round a casemate is too prodigal in the matter of weight. The armour of a uniform thickness which would go round six casemates in the "Shikishima," Elswick's latest, would armour the whole sides of a battery with the same thickness, into which you could put a dozen 6-inch guns, the ends of the battery being already provided for by armoured bulkheads joined to the redoubts. And therefore it would appear that a uniform thickness of

four inches round a casemate would be better than six inches on one side and two on the other, but that the most economical way of protecting your quick-firing battery is to revert to the old system of a central battery and side armour, with the addition of splinter compartments for each gun, ventilated to the upper deck and fitted with doors, by which means the guns' crews would not be asphyxiated by the noxious fumes of high explosives bursting in other parts of the battery.

As for the light Q.F. guns, ours are nearly all protected with shields. The *raison d'être* of these weapons is to repel torpedo attack, and you will see your enemy on a dark night much better if you have not a shield in front of you, and your enemy is going to shoot at you with a torpedo which is not likely to hit you on a 12-pounder gun shield. A shell striking a 12-pounder shield may dismount the whole apparatus or kill the crew, and a gun with a shield on presents a much larger target than one with a shield off. A dismounted gun would be impossible to replace in action, but a sight or a training wheel knocked away might soon be replaced. Therefore, as the life of a battle-ship against torpedo attack depends on its numerous light quick-firing armament, it would appear that this should be on the upper deck free from the encumbrance of a battery, where orders are imperfectly transmitted, free from shields, with good arcs of training. Let us melt down these shields and put up another gun; the side of the ship will protect the mounting and give shelter to the crew if it is necessary to man these guns in close actions, and in the place of the shield we should have a clear view to see torpedo craft at night.

Torpedoes.

The value of the automobile torpedo in action between two fleets is still almost an unknown quantity. Yalu, Manilla, and Santiago taught us practically nothing except emphasising the already well-known fact that most people would sooner be without torpedo discharges above the water-line.

The Chinese went into action at the battle of Yalu with torpedoes in tubes, with pistols inserted, and spare torpedoes in trollies at hand, but when the Japanese shells began to burst about the ships the torpedoes in the tubes were fired off, although there was not an enemy within two thousand yards, while the warheads were taken off the spare torpedoes and stowed below. The sudden sinking of the "Chih Yuen" was attributed to the explosion of one of her own torpedoes. The evidence from Santiago on this subject is even more conclusive. Admiral Sampson, in the *Century Magazine*, says:—"The disrupted plating of the bow of the 'Vizcaya' was undoubtedly due to the explosion of one of her torpedoes already in the tube." And from the "Naval Annual" we learn of the "Oquendo" that "The port forward and after broadside torpedo-rooms were also blown up, probably by shells striking torpedoes." Also the American Board of Examination on Wrecks after Santiago reported that "Loaded torpedoes above water-line are a serious menace to the vessels carrying them."

I do not think that any of this evidence detracts in the slightest degree from the value of torpedoes; it only means they must be below the water-line, and they must not be put into ships which can possibly catch fire. Torpedoes in battle-ships, like the heavy A.P. guns, have not yet had their trial, and we should be foolish to discard them on such evidence as a Yalu or a Santiago, or even without an action between two battle-fleets.

Chapter III.

General Equipment of Battle-Ships.

The principal considerations with regard to the general equipment of battle-ships are machinery and boilers, the stowage of coal, ammunition, provisions, water, and stores.

As far as the machinery is concerned, for a large vessel the best speeds appear to be obtained by triple screws, and as the Americans, French, Germans, Italians, and Russians are all adopting them, if we do not follow suit we may "get left," as the Americans say. The present Board of Admiralty have corrected the mistake of over twenty years and given us back our armoured ends, and they have also given us the invaluable water-tube boiler, so no doubt we shall soon see triple screws in the larger ships.

The reasons in their favour seem to outweigh those against them. They are claimed to be more economical at slow and high speeds, can be more easily placed below the water-line, saving expense in weight and money in the heavy armour round the cylinder tops of some vessels. Less draught is required for the vessel, consequently less pressure on the bottom, and therefore higher speed—a very important consideration, which has been amply demonstrated in destroyers, those of the lightest draught getting the speed easiest. We all know what a difference a foot of draught makes to a contractor's trial. Then there is less likelihood of the ship breaking down altogether, and the engine-room can be divided into three compartments—another important consideration. Propulsive efficiency is increased by utilising the following wake with the central screw. Economy of weight is effected by the use of smaller quarter brackets and shorter shafting outside the vessel for the wing screws. On the other hand, there is another complication in working the vessel, the engine-rooms are more cramped, and a larger staff of artificers and engineers is required.

At one time the question of water-tube *versus* cylindrical boilers was a very vexed one. I think we may claim that this question has been settled in favour of water-tube boilers. As it was said in the House of Commons, "water-tube boilers have come to stay." Still no effort should be spared to make water-tube boilers more economical. In some types the combustion is anything but satisfactory, and the greater part of it seems to take place at the top of the funnel, or the coal is blown away in dense clouds of smoke. There is no doubt the high speeds obtained by destroyers could not have been obtained by cylindrical boilers, and if a

water-tube boiler will make one craft go faster, why not another? To maintain a high speed during the hours of a day's fight is what war-ships will most require. The tactical advantage of being able to raise steam in an hour instead of five hours is also very great, and in many cases means a great saving of coal. How often our ships have to lie off some place with an open anchorage, such as Candia, in Crete. With a water-tube boiler one can lie with fires out for weeks with the certain knowledge that, should it come on to blow from seaward, steam could be raised before the sea has time to get up, wherein the danger lies of being put on the beach. On the other hand, with the old cylindrical boilers, owing to the time it took to raise steam, fires could never be allowed to die out in an open road where there was a chance of sea setting in from seaward; and after the ship had been off the place about three weeks, away she had to steam, perhaps several hundreds of miles, to complete with coal. Water-tube boilers would have saved all hands at Apia, in Samoa. An admiral lying with a fleet equipped with water-tube boilers in a break-water harbour, invulnerable to torpedo attack, with all his ships full up with coal and fires out, could start in an hour and a half after being informed by a wireless message from his cruisers that the enemy was at sea. Although water-tube boilers may be more wasteful in coal consumption while the squadron is under way, they would be, in the long run, more economical in war, solely on account of the short time it takes to raise steam with them and the possibility of waiting with fires out. Coal, or the want of it, is the life or death of a fleet; the want of it was Cervera's undoing. Had he had coal he would never have been caught like a rat in a hole. Some slight ideas of the amount of coal that would be required in a great naval war between this country and her rivals may be gathered from the fact that, in the 1899 naval manœuvres, B fleet, which went a couple of hundred miles the other side of Ireland, consumed over 31,000 tons during mobilisation.

The question of which is the best type of water-tube boiler to adopt is now being worked out by ourselves and our neighbours in a very systematic manner, and no doubt we shall soon be able to adopt one type for a class which will be a boon to those who have to keep them efficient: The destroyers, the torpedo-gunboats, and the new third-class cruisers are working out this question. Officers of destroyers generally give the preference to Thornycroft's and Reed's. Amongst the torpedo-gunboats, Babcock and Wilcox have obtained a very good record of 20·5 knots in the "Sheldrake" for 1·5 lbs. per I.H.P. per hour. Amongst the third-class cruisers, the "Pegasus," with Reed's boiler, has beaten most of her sisters. It will be interesting to watch the trials of the French cruisers of the "Montcalm" type, which are being fitted with Niclausse, Belleville, and Normand-Sigaudy boilers respectively. Of the French makers, the Niclausse type seems to have given particularly economical results, as little as 1·3 lbs. per I.H.P. per hour having been obtained with this boiler, but we shall see how the "Seagull" steams with them.

To determine the coal capacity of a battle-ship it is a question of how far it is necessary for your fleets to steam at maximum and economical

speeds, and what the maximum speed should be, and on that decide the power and weight of machinery and the coal capacity, remembering that the speed is not the most vital necessity of a modern battle-fleet, but that there should be no retrogression whatever from the speed and radius of action of the fleet to which the unit is to be added. It would be little use putting the heaviest guns in the world into a fleet that could not steam across the Atlantic at a good speed, but, on the other hand, colliers will accompany squadrons to supply them with the wherewithal, and a very large stowage of coal is bad for protection, insomuch that the protective deck or belt may be out of water or totally immersed.

The amount of ammunition to be carried by war-ships must always be a difficult question, being so intimately connected with the number and size of the guns in the armament, to say nothing of the rapidity of fire. There are two things which should never be lost sight of when determining the number of broadside guns and the amount of ammunition to be carried for each—that every gun disabled increases the supply for the remainder; that in many actions, and generally cruiser actions, only one broadside will be engaged at a time, which means double the amount of ammunition allowed per gun will be available for each gun of broadside employed. We know that the Americans had little enough at Manilla, and that the Chinese and Japanese at Yalu were getting rather short at the end of the day. I am not one of those who believe that an action will be decided in a few minutes any more to-day than a century ago. The Chinese were not greatly overmatched at Yalu, and that action lasted nearly all the afternoon till sunset. Ships should carry enough ammunition to last them half a dozen hours at least, on the basis that one side would be engaged at a time, and that the guns would be fired at an average rate of target practice, making due allowance for some guns' crews being swept away, and a proportion of guns being put out of action. In the old days, when the elements supplied the motive power, there was practically no limit to the supply of ammunition; now the case is altered, everything has to be taxed in weight to make room for coal, oil, and fresh water.

Rear-Admiral Plüddemann, of the Imperial German Navy, tells us that one man in the "Iowa" fired 135 aimed shots from a 4-inch Q.F. gun in fifty minutes at Santiago; that is to say, more than the weight of the gun and the mounting. The introduction of Q.F. guns has made the question of ammunition supply more important than ever, and some economies might be made in weights to give stowage for more ammunition. All mines and their cables and sinkers may well be carried in a special vessel (when the fox is run to earth there is time to send for the terriers). The number of boats, which are such a source of danger from splinters and fire, might be cut down. Boats are principally required for landing, and not more than half the ship's company would be required to land at a time. Battle-ships are usually in squadrons, and if any accident happened which necessitated the removal of the ship's company, assistance would be available from other ships in a much shorter time than a ship could hoist out her boom boats. If a battle-ship was sunk in ramming,

her boats would be of no more assistance to her than were the "Victoria's." A plain derrick might be substituted for the after mast, which is generally enveloped in smoke. It is not necessary to enter further into details here, but there are obvious economies of weight which may be effected without any great sacrifice.

The number of days' provisions carried by ships is becoming complicated by the ships' canteens. Some ships' companies live so much nowadays on their canteen stores, that the service rations last nearly double the time that they would in the ordinary course, and it is no easy thing for the commanding officer to regulate the amounts of provisions shipped on board for the canteen. The time that modern ships can keep the sea without calling in harbour for coal is boiled down to a matter of days, and where coal is obtainable provisions are also usually obtainable. If in view of this it is considered sufficient to complete the fleet with three months' provisions, and in addition the ships complete themselves with three months' supply of canteen stores, it is obvious that a considerable quantity of one or the other or both might with advantage be converted into powder and shell. There is as much difficulty about cutting down the number of days' service provisions carried as in cutting down the canteen provisions; on the one hand, some ships may not have a canteen, or something may go wrong with it and it has to shut up shop, or the canteen provisions may not turn up when they are expected, and you might be left with only a limited supply of service rations. On the other hand, if you cut down the canteen provisions, the men who are accustomed to feed on bloaters, butter, and bacon become discontented with the service rations.

That a ship like the "Majestic" turns over £600 per month in her canteen shows how general the system of canteen feeding is becoming; there are two ways out of the difficulty: one is to put the supplies of canteens in the fleet out to tender to contractors, and give the amount tendered to some Service fund, bind the contractor down to keep supplies in certain ports, and allow him to have his own accountants on board, or let him pay men belonging to the ship's company to keep accounts, holding him altogether responsible for the good management; the other is for the Service to do it themselves, allowing messes and individuals to take up provisions or stores of a canteen nature, and charge it against them at the end of the month on the ledger like slops. As there is very much that is inflammable about canteen provisions and stores, in war-time they must go below the water-line; and if the spaces below are full of service provisions they may have to go overboard instead. Imagine the faces of the ship's company on the eve of battle when the bloaters, the butter, and the bacon are consigned to the deep!

The question of the supply of fresh water for modern ships with water-tube boilers is a serious one. Nothing but condensed water can be used in water-tube boilers, say the experts, because the deposits in water from the shore collect in the boiler and choke the tubes, causing them to be immediately burnt through. Under these conditions, ships which have much steaming to do with water-tube boilers, have often difficulty to keep

themselves supplied with fresh water; more especially when they have small tank accommodation, and their fresh water supply is always at the expense of their coal, which means their radius of action. What we want is a water-tube boiler which can be fed with ordinary clear fresh water from the shore, and I think it will be found that oil and salt are really its greatest enemies. The oil from the cylinders becoming condensed with the steam, and passing through with it to the condensers, is discernible only by the milky tinge it gives to the condensed water; while the salt gets in through leaky tubes in the condensers, and the pair boil up together in the scum, with any other deposits or loose scale in the boiler, until they are carried away by the currents of ebullition to block a tube.

Other details of equipment are boats, funnels, anchors, etc. As for the boats, after the bombardment of Alexandria, it is said some captains found it difficult to get a boat to float long enough to take them on board the flag-ship. Before Yalu the Chinese landed most of their boats. Nearly all the boats in the Navy are of wood, and yet a steel boat is just as seaworthy. A wooden boat did not save nearly fifty men being drowned when the "Edgar's" launch capsized. A steel boat is just as light, and not so easily broken, lasts much longer, and is as easily repaired; it does not catch fire or make splinters, or have to be hove overboard on the first whisper of war. It does not get heavier with immersion, it can be comparted or discomparted, or made a lifeboat, and does not leak when the big guns are fired. In fact, it is in relation to a wooden barge in many respects what a steam cattle-ship is to the Ark.

In the "Majestic" class one shell might destroy both funnels, and lead to the whole ship being enveloped in dense smoke; and, therefore, the funnels should be further apart, with draught plates to allow the smoke from the foremost boiler-room to go up the after funnel, and *vice versâ*, in case of one funnel being shot away; and the funnel casing between decks should be armoured if not in a battery.

As economy of weight is of the greatest importance to a war-ship into which so much is crammed, when we see an obvious economy such as the stockless anchor, why do we not give it a trial? The mercantile marine have had it for years, and some captains prefer it for holding purposes to the stocked anchor. The catting davits and anchor beds of the present arrangements mean some tons which might be mounted in the shape of another gun by adopting the stockless anchor. Most of our ships carry two bowers and one sheet anchor. If we do not like to make so radical a change all at once, one of the bowers might very well be of the stockless type, heaving up into the hawsepipe, for facilities in anchoring and getting under way at short notice; while, if it was necessary to moor, and the stockless anchor was not thought good enough for that purpose, the sheet could be bent in the place of the stockless anchor. To remove the possibility of delays of two or three hours, which are liable to occur with a foul anchor of the present pattern, would be of great advantage.

Chapter IV.

The Armoured Cruiser.

This type of ship is of quite recent birth, and has been born of our great sea trade. The hundreds of unprotected millions which we have upon the seas is a great temptation to our enemies, who, being unable to cope with us in battle-ship building, would naturally enough seek to ruin us financially, or otherwise, through our trade; for this avowed purpose the armoured cruiser of great speed, armament, and endurance was launched into the world, another engine of destruction. The "Powerful" and "Terrible" were the replies of our Admiralty to this move, and they being the first of the sort cannot be expected to be perfection. Public opinion is a very good critic, and he has proclaimed them too large as a target and under-armed, but they will make very good armed troopers in war, so the money is by no means thrown away.

The business of the armoured cruiser in war-time will be the convoy, and cruising on the trade route, or dogging one of the enemy's ships. The blockade of a determined enemy in his ports is played out in any other place but a Santiago. Admiral Sampson writes in the *Century*:—"The conclusion that the English have reached, based upon annual trials, is that it takes about three ships to blockade one. I think it is also their conclusion that in ordinary circumstances, I would not say the special circumstances of Santiago, but where the opening of the harbour is moderately great, while one or two ships at a time may be blockaded, it may be expected that some of them will escape. Perhaps if the Spanish had more energy, had tried harder, they might have demonstrated the rule even at Santiago. . . By choosing the time and the weather, I believe they could have verified the rule." So if the enemy's cruisers get out, armoured cruisers will have to hunt them down and bring them to battle if trade is to go on.

It has always been recognised that the Navy is responsible for the defence of the mercantile marine, and this is no light responsibility when it is considered that the gross tonnage of steamers alone of 100 tons and upwards owned by the United Kingdom and Colonies in 1898-99 was 11,168,189, while that of all the remaining countries in the world only amounted to 8,343,103. Practically 70 per cent. of the carrying trade of the world is in our hands, while the total amount of our trade for 1897, exclusive of bullion, amounted to £738,188,118.

The merchant-ships themselves are absolutely defenceless; they could not even keep a destroyer at a respectful distance, although, to my mind, all British merchant steamers of over 1,000 tons displacement, carrying British goods, should be obliged to carry half a dozen 6-pounders, six naval reserve men to man them, and an armourer to keep them in working order, as an insurance against destroyers in war. Even if the taxpayer has to pay for it, it ought to be done. The Bank of England found it necessary to advance millions to Barings to save themselves. Why should not the Government advance these 6-pounders to shipowners, unless they choose to enforce it by law?

In the late Fashoda crisis there were hundreds of British merchant steamers in the Mediterranean and Red Sea, any one of which might have been sunk by a torpedo-boat. What cruisers of ours were there would have been required by the fleet. There is a thousand miles of coast between Malta and Gibraltar where the enemy's torpedo-boats, destroyers, etc., might lie an hour off the trade route, just to come out now and then and tell a fine fat Britisher to follow or be sunk. Let those who are sceptical on this point read the fourth article in the JOURNAL of the Royal United Service Institution of November, 1898, which is translated from the Russian, and in which a Russian, pointing out the advantages of a station in the Red Sea, says:—"Our torpedo-boats and cruisers could thence at any moment close to the English merchant steamers the trade route through the Red Sea. The possibility thus afforded to us of closing this route would compel the proud Britons to considerably lower their tone, which is always and everywhere hostile to us." What would be the effect on the Exchange to hear that in the first week of the war two hundred merchant-men had been captured or sunk? Under the wing of an armoured cruiser, with sufficient 6-pounders in the convoyed ships to make destroyers respectful, a different tale will be told, and the Stock Exchange will have an interval for lunch, and get down to the suburban retreat in time for dinner.

The armoured cruiser can be the life of the mercantile marine if they will only help themselves, but if they do not, God help them, for the enemy's destroyers won't. Their object will be to capture or sink while they have a torpedo left, and then "leg it" for their base.

Having decided that armoured cruisers are necessary for the protection of our trade, we must arrange the type of vessel according to their necessary qualifications; they must have great speed, endurance, armament, and protection, and all these can only be produced in a large ship. For speed, nothing under five hundred feet can successfully cope with a heavy Atlantic sea; for endurance they must have sufficient coal to cross the Atlantic at full speed, and sustain a chase after the enemy's vessels; for armament, first, guns capable of penetrating the armour of other armoured cruisers, which the "Diadem" class have not; also a heavy battery of Q.F. guns to destroy the unprotected parts of the enemy's cruisers, and a battery of light Q.F. guns for repelling torpedo attack; they must also have submerged tubes in the case of a duel with an enemy's armoured cruiser, or for such occasions as they may be required to fight in the line. For armour, the way in which the "Colon" got forty-eight miles from Santiago has taught us the value of having the guns protected.

I should like to see armoured cruisers with five or six inches on the side. This, of course, could not be done with ships like the "Powerful," because she is too high out of the water. The high bow is a necessity, but not the remainder of the ship; that should be arranged by the height necessary to fight the guns in moderate weather. Every inch above the water is something more for the enemy to shoot at, and no matter where a shell bursts about a ship it will do some harm, and possibly kill some men. Not one action in fifty is fought in a gale of wind, and to my

mind it is wrong to increase the target out of all proportion for the sole purpose of enabling the guns to be fired in a heavy gale of wind when very little could be hit by them. Increase of freeboard means increase of surface to be protected, gun redoubts, ammunition hoists, etc., and therefore increase of weight and decrease of speed, and the ship with the greater speed may be able to choose her weather.

The presence of the "Asama," built for Japan by Elswick, in naval ports has been the cause of much comparison with our armoured cruisers in respect to armament. One hears on all sides, "Why cannot we have ships like that?" There is no doubt that on paper the "Asama" can give points all round to our armoured cruisers. For over 4,000 tons less displacement she has a superior armament to the "Powerful"; she obtained her speed of 22 knots more easily; in relation to the size of the ship her coal stowage is greater; she is armoured all along the waterline, which the "Powerful" is not; ten of her fourteen 6-inch guns are in casemates, as against twelve in the "Powerful"; and her four 8-inch guns are in turrets, as against the "Powerful's" two 9·2-inch behind shields. What has become of that extra 4,450 tons? It appears to be absorbed in 92 feet of length, 4 feet of beam, and 5 feet more draught. If this waste tonnage had been converted into another vessel we might have had a cruiser like the "Hai Tien," 4,300 tons; 17,000-I.H.P.; 24 knots; with an armament of two 8-inch, ten 4·7-inch, twelve 3-pounders (all Q.F.), etc. This armament roughly represents the increase of armament which could be carried by a ship of the "Powerful's" size. I do not say advisedly, because there is the all-important question of ammunition supply; but I hold it is a mistake that our cruisers, which will so often have duels to fight, should not more nearly approach the armaments of foreign cruisers.

What is the use of going to the bottom with all the ammunition and coal in the world? We do not want to say, "If you had not knocked me down I should have lasted you out." Give the sportsman the choice of his weapon; do not give him a single-barrelled gun and an extra box of ammunition and send him after a lion, unless you want him to come back mauled. The "Drake" class will, I think, be very fine ships, and about right in respect to armament, but previous remarks with reference to side armour *versus* casemates apply equally to them. After the late war, the Board of Experts, which includes the chiefs of the bureaus of the Naval Department, submitted a programme for the consideration of Congress for the construction of fifteen ships, amongst which were three armoured cruisers of 12,000 tons, and 22 knots speed, to be covered with heavy armour from stem to stern, carrying four 8-inch guns in turrets and twelve 6-inch Q.F. or broadside. There is no doubt that this change from the disposition of the "Brooklyn's" and "New York's" armour was arrived at after full consideration of the advantages derived by the "Colon" from the 6-inch armour over her guns, and the fact that when the "Colon" was finally beached she was almost uninjured; the "Brooklyn's" Q.F. battery of 5-inch guns being unable to pierce the "Colon's" 6-inch steel armour, which was manufactured at Terni much on the Harveyized system.

Chapter V.

Scouting Cruisers.

Owing to the great steam revolution of the nineteenth century we have numberless types of these vessels. The protected cruiser has taken the place of the frigate of the last century—its primary object is to scout for the fleet. As long as this country is in the position of the hunter rather than the chased, we shall want plenty of them, and they will be required to do a lot of steaming. We cannot afford to build them all as large as the "Powerful," we could not have enough at that rate, and they would use up all the coal in England if we had many such, whilst at the present time there is no doubt vessels of the "Powerful's" size should be armoured cruisers. It is difficult to say where the line should be drawn between the two; the "Colon" of 6,840 tons, slightly smaller than her consorts, proved to be the better ship; her 6-inch armour enabled her to get clear of the American fleet; and had she been able to maintain a speed of 17 knots, that is 3 knots below her contract speed, as a ship certainly ought, she would undoubtedly have escaped. As it was, she could only maintain a miserable 13·7 by dint of shooting the stokers when they left the fires, which was shown by the pistol bullets found in their bodies by the Americans both on deck and in the stokehold after the surrender.

One of the old theories exploded by the late war is what Admiral Colomb called "the no armour better than thin armour theory." This theory was propounded before the Q.F. gun was born, in the days when ships only carried heavy guns behind heavy armour; but the theory remained in our construction long after Q.F. guns were produced to upset it, and pertains even to the present day. To my mind, protected cruisers should carry a certain amount of armour over their water-lines and batteries according to their tonnage. If armour cannot be carried to keep out 6-inch shell, it may at least be carried to keep out the 3-pounder, 6-pounder, or 12-pounder. It was the small shells bursting in every direction that forced the Spanish protected cruisers to seek for soft spots on the beach so soon after they bolted from Santiago.

Scouting cruisers must be very fast, be able to steam well against head seas, for which purpose they should be 400 feet in length or over; they should have a large coal supply, which must be at the expense of armour, but being more lightly armoured they should have the "legs" of an armoured cruiser, against which it might not be judicious to contend singly.

For protection, our usual plan is to protect the vitals by an armoured deck varying in thickness according to the size of the vessel, and to protect flotation by athwartship bulkheads, armoured hatches, and coffer-dams. The flotation might be further protected by a larger number of athwartship and longitudinal bulkheads above the armoured deck than is usual in our ships, dividing the space between the armoured deck on the water-line and the deck above into a large number of small water-tight compartments. This plan would not involve much additional weight, the

compartments being smaller the bulkheads would be of a thinner material, and the deck above having a large number of supports could be made thinner. With regard to the question of the protection for the guns of these vessels, in some of the latest types the guns are all in a row on the upper deck, before and behind which is an athwartship bulkhead about an inch in thickness, just enough to burst a shell, which, if the ship happened to get end on to the enemy, might sweep the guns' crews all along the deck. We read that at Santiago one shell from the "Brooklyn" raked the "Vizcaya's" gun deck, killing half the men on it and wounding most of the remainder. Of course these bulkheads as they stand could be given extra protection by flaking cables round them, but the ships would be better for an armoured bulkhead, before and behind the broadside gun deck, to keep out raking shots, which were always the greatest danger even in the days of the old wooden walls; and that danger has not diminished at the present day. An 8-inch shell entering at the stem of the "Regina Christina" at Manilla burst a boiler and blew up the deck. Each gun's crew might be protected by thin steel traverses between the guns. Sir Andrew Noble tells us that high explosives break up shells into very small fragments, but that thin steel mantlets offer very good resistance to the pieces. As for the shields on the guns, I say away with them; as at present fitted they only serve to burst the shells on one side and spread a net for them on the other, in each case annihilating the guns' crews; let us "take up savings" for the shields in life, in money, and in weight, and put the weight saved on the side. If a shell bursts on hitting a gun shield, it bursts in the battery and kills the guns' crews, while if it bursts on the ship's side it may fall harmlessly into the water. There is no objection to the small shields on the fore part of some guns mounted in casemates, to keep out small projectiles; it is those on the upper deck in unprotected batteries which most concern us here.

As the actions scouting cruisers are likely to be engaged in will be like those of the old frigates, more often a duel than otherwise against other protected cruisers *alias* frigates, there is no great necessity to build them for ramming, which would always be a difficult matter in a single action. At the same time the bows should be strengthened by stiff steel plates, and divided into small compartments for cases of emergency. The idea that cruisers may be launched against battle-fleets to upset them before a battle, will no more hold water to-day than it would have with the frigates a hundred years ago. The enemy will have his cruisers too; but there is no saying what a determined man might not do amongst an enemy's ships at night.

As it will not be the business of these ships to contend against armour-clads, 6-inch Q.F. guns should suffice for their primary armament; that is to say, guns firing rapidly projectiles of about one hundred pounds, which are proved to be the greatest weight which can be handled by our seamen for any length of time without making use of mechanical contrivances. For the secondary armament they must have a large number of light Q.F. guns, which in addition to repelling torpedo attack are the mitrailleuse of a cruiser action. To take a lesson from the shore, before Santiago an

American machine gun battery captured a Spanish artillery battery by simply advancing one gun in front of the other, and keeping up such a fire on the artillery battery that the Spanish gunners could not work their guns, which shows what may be attained by rapidity of fire. In arranging the armament we must guard against a multiplicity of weapons, which means the same for the shell rooms, magazines, fuses, spare parts, store accounts, and complicates organisation. The gun-maker sets the fashion in guns, as the West End hatter makes his hats, with method in his madness, a little longer or a little shorter, not to suit the public need, but to make you buy a new one. When a new 4·7 is required he makes it of 4 inches so that it will not take the old ammunition, as if ·7 of an inch would matter two straws in a naval battle, except as regards complicating supplies of ammunition for the fleet. 4-inch guns are being mounted in our latest third-class cruisers, while there are some hundreds of 4·7-inch guns of a recent pattern afloat in our Service. A ship with 4-inch guns runs out of ammunition, and wants to borrow a little to go on with from her consort, but cannot for the fraction of an inch. Ammunition supplies will run short, not only in our ships but at our bases, and every extra calibre increases the chance. Let us make up our minds to a 4-inch or a 4·7 and land the other, and the same with a 3- or 6-pounder.

With regard to the ammunition supply of these cruisers, it is one thing to howl for a heavier armament and another thing to keep the guns supplied in action. It is a most dangerous thing to keep a lot of spare ammunition about the decks, as was demonstrated on the "Matsushima" at Yalu, whilst on board the "Baltimore" at Manilla eight men were wounded by the explosion of a box of ammunition which was struck by a shell; being the only men wounded on the American side at the battle of Manilla Bay. We have no records of what damage was done by leaving ammunition about on board the Chinese and Spanish ships, probably those who suffered thereby did not live to tell the tale. It is even very questionable if the armoured ammunition box is a sound investment. In some of our latest ships seven rounds of ammunition can be got up in two minutes to supply three guns, each of which can fire seven rounds in the same time, which is a defect that might be remedied by improved ammunition hoists. One would not advocate the fitting of magazines directly under each broadside gun in the face of the extremely high temperatures of over 110 Fahr. experienced in the magazines of foreign cruisers so arranged. The boilers and engines must be in the middle of the ship, and they must be hot while steam supplies the motive power, also the coal must be near and handy to the boilers. For these reasons the middle part of the ship is not the place for ammunition, although the difficulty may be overcome by ammunition passages in large ships.

It is not necessary to lay down any hard and fast rule as to the requisite size in actual displacement for scouting cruisers; those ships which will be required for scouting in the Atlantic or other oceans must be of sufficient length to contend with the seas encountered in those oceans, while, on the other hand, smaller vessels will suffice for enclosed

waters, such as the Mediterranean. In all cases we must be more or less guided by the class of vessels which our possible adversaries are building, and always with a view to go one better.

In addition to the scouting cruisers, we require a smaller class of cruiser, what we call a third-class protected cruiser. These vessels have replaced the old sloops, and are principally required for police work. Our interests are so world-wide, we are what the French call us, the world's policemen. Whenever any petty potentate "shuffles off this mortal coil," or there is a riot, a massacre, a hurricane, an earthquake, or a famine, the commander-in-chief receives a telegram for a ship to protect British interests, and for this purpose we must have some small cruisers to get over the water quickly and not burn too much coal. The "Scylla" and "Pelorus" classes answer this purpose admirably, and they can very well be used as intermediaries between the fleet and the scouting cruisers in war-time, in such places as the Mediterranean, in which the distances are well within their coal capacities. These vessels would also be invaluable to assist armoured cruisers with the convoy, and for cruising on the trade routes, especially at such places where the trade routes converge, such as the Channel, the Straits of Gibraltar, the Canaries, the Cape Verdes, the Cape, Socotra, Ceylon, Singapore, Hong-Kong, Albany, Tasmania, etc. They would be invaluable between Gibraltar and Aden, and also in the blockade of an enemy's coast.

While considering cruisers, it will not be out of place to investigate the cause of the marked superiority of the "Colon" over her three consorts. The "Teresa," "Vizcaya," and "Oquendo" were three sisters, in all respects identical, and all built at Bilbao, whilst the "Colon" was built at Genoa for the Italians but was eventually sold to Spain. On paper there is little difference between the two classes, but paper comparisons are sometimes very misleading, and those who seek to prove their theories by such means alone are often at fault. Taken from Brassey they are as follows:—

Ship.	Displacement.	Length.	Beam.	Draught.	I.H.P.	Belt.	Gun.	Deck.	Armament.	Speed.	Coal.
Teresa... Vizcaya Oquendo	7,000	340	65	21·6	13,000	12	10·5	3	Two 11-inch, ten 5·5-inch, eight 2·2-inch, eight 1·4-inch, Q.F., two machine guns; six torpedo-tubes.	20	1,200
Colon ...	6,840	328	59·8	24	14,000	6	6	1·5	Two 10-inch, ten 6-inch, six 4·7-inch, ten 2·2-inch, ten 1·4-inch, two machine guns, Q.F., four torpedo-tubes.	20	600 1,000

The "Colon," without her two 10-inch guns would appear on paper to be inferior in many respects to the other three. She came out of Santiago third in the line, and ought to have had as good a hammering as any of her consorts; but while the other three ships were knocked to pieces, and American shells were exploding magazines and torpedo-rooms of the "Vizcaya" and "Oquendo," together with the long-cherished theory that no armour is better than thin, the "Colon," at an average of 13·7 knots, steamed past the American fleet, and actually got out of range of her pursuers. In the end she was run ashore practically uninjured when the "Oregon" and "Brooklyn" were observed to be gaining upon her, and her sea valves were opened and broken to prevent the vessel falling into the hands of the enemy. This was truly a noteworthy performance, and a victory for medium side armour over thick belts, heavy decks, and unprotected top-sides, principally due to the flat trajectory of modern ordnance, whereby the "Vizcaya" and "Oquendo" were *hors de combat* before their belts or armoured decks were even tested. The belt of the "Teresa" was pierced once by a shell from the "Texas."

To fully appreciate this, the most important lesson of the late war, it is necessary to review the disposition of armour in each class. All the armour of the "Vizcaya" class was expended in a heavy 12-inch belt and 3-inch armour deck, while that of the "Colon," although only half the thickness, was disposed more evenly over the vessel in the form of a complete belt from stem to stern, and side armour extending up to, and enclosing, the central battery of ten 6-inch Q.F. guns. No doubt the "Colon" was the more heavily armoured of the two, and some of her armour was at the expense of her coal capacity—but the proof of the pudding is in the eating; on the one hand, the armour kept everything out; on the other hand, three 7,000-ton cruisers were knocked out of recognition in a few minutes.

Here, then, is much food for reflection, especially when we consider the number of our cruisers almost identical in disposition of armour with the "Vizcaya," "Teresa," and "Oquendo," which have been weighed in the balance and found wanting. How will it be with our "Australias," "Arrogants," "Blakes," "Powerfuls," "Crescents," "Didos," and "Diadems"?

With regard to the use of inflammable materials in the construction of cruisers, we must refer again to the fires on board the Spanish ships. A Spanish officer said that, before running the gauntlet at Santiago, the cruisers' decks were flooded and the scuppers plugged, but yet they burnt. It has truly been said the reason these ships burnt so fiercely was that their wooden decks were laid over beams without steel decks underneath, and that where there was any plating under the decks, the planks were only charred. As Admiral Wilson aptly put it, at the discussion of Admiral Colomb's paper on the "Lessons of the Late War," "if you want to light a fire, you put the wood on a grate." On the other hand, decks may be blown up in places, in which case the planking and the pitch seams would probably be fired, and if all woodwork was abolished in war-ships there would no longer be the necessity for the complicated firemains and risers

all through the ship, and consequent saving in piping, valves, hoses, and fire-engines.

At Yalu the "Naniwa" was struck by a shell in a coal bunker without suffering much damage, but the shell did not contain a high explosive. It is high explosives we have to fear, and if a melinite or lyddite shell will fire coal, then the coal must go below the water-line, below the protective deck. Coal bunkers can catch fire, they do so in some destroyers without shell to help them, and such fires are not easily put out without flooding the bunker. If, in addition, the in-board side of the bunker is blown out by the explosion, one could imagine a considerable conflagration might ensue. Spanish officers say this happened at Santiago. As the alteration in the construction of ships for the stowage of coal is involved, this question should be fully investigated by means of experiments with lyddite shell against sections of bunkers.

There is so little heavy traffic on a modern war-ship's decks, now the masts and yards are abolished, and ammunition may be brought up from below through tubes or scuttles in the immediate vicinity of each gun, that there is really no reason why corticene should not be used in lieu of wood, even on the upper decks of ships which are fitted to coal through the ship's side; for those which are not so fitted, such as small cruisers, corticene might well be fitted in places where coal would not be landed on the upper deck, and on the poop and forecastle.

Chapter VI.

Stationaires and Torpedo-Vessels.

Gun-vessels we must still have for all foreign stations, as stationaires, sentinels, watchdogs, call them what you will. Their purpose is to watch and report, to afford a guard for a consulate here or a sanctuary for refuge there; to overawe a turbulent population in a seaport town, to overhaul a pirate or a filibuster, to take part in an expedition up a river, or exact reparation from a riverside chief.

Until quite recently it has been the practice to build these vessels composite to make them more inhabitable in hot weather, but the latest types are being built of steel, a great improvement, on account of the fire question; and, after all, a steel gun-boat painted white, with good awnings and side screens, can exist very well in hot weather. There appears to be no necessity to give these vessels any very high rate of speed, or to overburden them with masts and yards. The principal considerations are light draught to get close in shore, into inner harbours, or ascend rivers; to carry a good coal supply for long-distance steaming; to have the most economical engines and boilers procurable; a light fore-and-aft rig to steady the ship in heavy weather, and a square sail forward to make use of a fair wind.

The torpedo-gunboat is for the present eclipsed by the destroyer. Originally built to catch torpedo-boats at sea, it is in the position of

being unable on paper to run down a destroyer which has superseded the first-class torpedo-boat; unable to carry sufficient coal to be of much use for foreign station work, with a practical steaming limit of only 1,600 to 2,000 miles in smooth water; with engines altogether unprotected and torpedoes on the upper deck, it is difficult to see what *rôle* could be satisfactorily performed by these vessels in war-time, and no doubt it will be some time before we build any more of them. That they may always be useful in a night attack was shown by the way in which the "Almirante Lynch" and "Almirante Condell," sisters of our "Sharpshooter" class, attacked and sank the "Blanca Encalada" in Caldera Bay during the Chilian Revolution of 1891. They have simply been superseded by a faster and handier vessel, produced by giving the contractors a free hand.

Destroyers.

The late war in Cuba did not show up to advantage the few destroyers and torpedo craft that took part in it, principally because there were insufficient to act in concert, and those possessed by both contending parties were used for other purposes than for which they were designed. The Americans used their torpedo craft as gun-boats, and attempted cutting-out expeditions in the day-time; while the Spaniards at Santiago never seriously indulged in a night attack. The three destroyers that accompanied Cervera across the Atlantic encumbered the squadron by their breakdowns and requirements, and caused frequent stoppages on the way.

Although it is the common idea that destroyers have suffered much in prestige on account of the little effected by them in the late war, we must not on that account be too hasty in their condemnation. In the first place, the Spaniards had very little previous experience in handling and working them; and we all know what that means in our own instructional flotillas, where new hands are so apt to cut off a barge's bowsprit or bump the dockyard wall, and where many new classes of stokers lose the water in a boiler or run a metal. What did the Spanish destroyers do when they got across the ocean? To steam out in daylight against a large ocean greyhound armed with Q.F. guns could only have one result. Three shots were enough. With an officer and two men killed, and several wounded, the "Terror" with difficulty crawled back under the guns of San Juan. To run the gauntlet of the American fleet through a blinding storm of shot and shell—poor things! it was their death warrant.

Destroyers and torpedo craft can only act under the cover of darkness against large vessels armed with Q.F. guns; and even then, if possible, there should be several together, so that if one fail another may get in. We have found by experience that about eight together under one man in a flotilla is best for mobility and efficiency; with more than that some vessels must of necessity be so far apart that they cannot get the signals; and only those who have been in charge of destroyers at night in pilotage waters, with tides and fogs, rain or snow, can fully realise the anxiety and difficulty of manœuvring a flotilla if the signals are not properly answered.

That torpedo-boats and destroyers are most useful weapons when properly handled was fully proved in the previous war by the Japanese at Wei-Hai-Wei. In the third attack by the Japanese the "Ting Yuen," Admiral Ting's flag-ship, was sunk, and the "Ching Yuen" was torpedoed, and in the fourth attack two ships were sunk and a third injured. Fifteen Japanese torpedo-boats in all effected this damage to the Chinese squadron for the loss of two boats, nine men killed, thirty-one wounded, and five drowned, while the Chinese lost over two hundred men. At Yalu twelve Japanese ships were opposed to fourteen Chinese ships with eight torpedo-boats, the result being that five Chinese ships were burnt or sunk, at the expense of sixty-nine killed and one hundred and sixty wounded amongst the Japanese, of which eighty were accounted for in one fell swoop by the bursting of ammunition in the ready rack on board the "Matsushima," ignited by the explosion of a shell from a Chinese 30·5-centimetre gun. This speaks volumes for torpedo craft launched against an enemy's fleet at night, as an arm of the main body which supplies them with energy, and without which they had never been there. That torpedo-boats are almost valueless in day-time was shown at Yalu when the Chinese had eight boats which did no damage whatever; but when they rejoined the already defeated Chinese fleet at sunset the Japanese fleet hauled off, not caring to risk a night action against ships with torpedo-boats.

It thus remains that in the Chino-Japanese war fifteen torpedo-boats effected more damage than a fleet of twelve Japanese ships for a smaller loss, and nothing that occurred in the late war disproved their value.

There are other uses for destroyers in war besides attacking the enemy's vessels. They may be used as messengers and scouts at small radius, too much of which was shown to be a mistake. The Americans used them as messengers, with the result that after a short time they were fit for nothing, and took all the resources of the fleet to keep them in repair. But as vedette-boats in keeping watch round the fleet at night they would be invaluable, and also for harassing the enemy's torpedo-boats. The destroyer has practically replaced the torpedo-gunboat and the first-class torpedo-boats.

The primary object of the torpedo-boat was to carry a couple of tubes, and a few light Q.F. guns, the former for attacking ships, the latter for attacking other boats; for this purpose boats were built 120 to 150 feet long. While ships were of a size to be sunk or materially damaged by a 14-inch torpedo this held good, after a while ships became larger and better protected, and a larger charge, carried in a larger torpedo, was required to torpedo them successfully. Being Progressists, like the worshippers of Siva, modern ideas change our faith. Hence the birth of the destroyer, which was designed to run at high speed and carry two 18-inch torpedo-tubes. We must not lose sight of this point; guns are a secondary consideration for destroyers. 200 feet or thereabouts was found to be an adequate length to steam 30 knots and carry two tubes. The Americans are building boats a 100 tons bigger and some 50 feet longer than most of our boats for the purpose of carrying a second 12-pounder, when the

guns are the very last thing to be used for their primary duties of attacking an enemy's fleet at night. The extra 50 feet of length and 100 tons displacement make them much larger targets, and much less easily handled, especially in the narrow waters of their probable spheres of action, where length and draught of water are the most important considerations. Only those who have had the job, in a destroyer, of trying to get in or out of harbour watched by electric lights, can fully appreciate the value of being small, and having light draught of water. Until some one invents a safe explosive of greater power than guncotton, which might be carried in a smaller torpedo, it would be unwise to build torpedo-boats of smaller dimensions than those which we have found by experience fulfil the required conditions, *i.e.*, to carry two 18-inch tubes, to steam at high speed, and keep the sea.

For secondary considerations only water-tube boilers will give the high speeds obtained in these boats. Thornycroft's and Reed's are those most generally liked. In all our destroyers the officers and petty officers live aft, and the crew forward; the Americans and the Japanese have changed this in some of their boats, putting the captain and officers forward, which seems to be a better arrangement, on account of the distance of the navigating platform from the officers' quarters. When a boat is travelling 30 knots she runs a mile during the time it takes to get from the forward platform to the cabin and back again.

It is usual to place the electric search-light in the middle or after part of the boat, where it is often masked on certain bearings by the destroyer's own boats or by her smoke. On a bridge before the funnels the electric search-light would command a free all-round arc of training, out of the smoke, and well above the water-line for distant signalling with an arc lamp. This bridge might also contain the steering wheel, compass, and telegraphs, it should be behind and raised slightly above the gun platform, well stayed and protected from the driving sea. Captains of destroyers have been obliged to remain on the gun platform twenty-four to thirty-six hours in bad weather, making passages, and this platform is like a bathing machine found in some parts of England for the gentler sex, which when pushed into the sea the water comes up breast-high through apertures into the bottom. I should like to see the fore part of the vessel built up to form the gun platform, instead of putting the 12-pounder on the top of a poky little conning-tower, in which no commander would ever hide his head on a dark night when he had to keep his eye on his consorts and find the enemy. The manœuvring and navigating of these vessels is at all times such a delicate business, that the greatest attention should be given to the position from which the vessel is to be worked.

Chapter VII.

Sea-going Training-Ships and Fleet Auxiliaries.

As the subject of this essay embraces ships of all types, it will not be out of place to say a word with regard to the class of vessels necessary for

training at sea the boys who are growing up to man and fight the complicated modern battle-ship. Those in use now must sooner or later require replacing, and the question will then arise as to whether it is necessary to go on constructing vessels with masts and yards for the purpose of training the young idea in sails and seamanship. I think it would be altogether wrong to do so. A boy when he first goes to sea learns more in a year than a full-grown man in three; it is the time when his brain works quickest, and his memory retains most; as he grows older his brain gets clogged and works slower year by year, and, therefore, it is the time he ought to be learning his trade, and what is going to be most useful to him through life; and that trade is to shoot straight with rifles and guns and torpedoes, to know all about his weapons and the working of them, to be able to sail and pull boats, to steer steam-boats, to work in destroyers, to mine and countermine, to work search-lights and semaphores, etc., and, surely, when all the mechanism of these weapons is considered, that is enough without addling his head with leads of ropes and fittings of sails, used by our forefathers in their estimable arks, and which he will never see again except in a model room.

If it is still thought necessary to put masts and yards in surveying-vessels and gun-boats—and many would get through their work much quicker without them—then by all means train up a small proportion for this service. Go on board a battle-ship and see what there is to learn, and then consider that the young idea is at sea in an antiquated ship furling and loosing a topsail—that makes one think! We are ready enough to laugh at the Chinese digging out at target practice with bows and arrows to drive the hated foreigner from the most ancient of lands, but we live in a glass house.

The fact is the bluejacket is no longer a seaman of the past, he has become a nautical gunnery engineer. In olden times the seaman worked both the motive power and the guns; the motive power is not gone, it is only shifted to the engine-room; why have a separate class? Every day their duties are drawing them nearer together. The electricity which burns the search-light runs on the engineer's lines to a certain point, after which it is switched on to those of the gunnery or torpedo lieutenant. By-and-bye there will be lieutenants for engineering duties, the stoker will have his turn on deck, and the deck hand will take his turn below, as they sometimes have to do now on a steam trial, without it hurting them much. The bluejacket of the present day is required to be a gunner, a sapper, a linesman, and an up-to-date seaman; why, in addition to this, try to make him a seaman of the last century? That won't help the ship along; much better make him a stoker if he has not enough to learn already.

If you want to exercise the boy's nerve, send him for a cruise in destroyers, and make him fire the guns and torpedoes—there is plenty of nerve required for that. Can any say conscientiously that they never felt nervous when they first fired the guns—that they never had the feeling that the thing might burst, or break loose and come on the top of them, before they learnt how the gun was controlled?

A training-ship ought to be an up-to-date fighting machine; we have stacks of cruisers in the yard which cannot be commissioned without calling out the reserves, or breaking up the gunnery and torpedo schools; how much better it would be for those and the boys if the obsolete training-ships and their obsolete weapons were sold, and the boys turned over to keep half-a-dozen cruisers in working order, instead of these cruisers laying up in the yards "where rust and moth doth corrupt."

Another argument in favour of using modern cruisers for training at sea is the necessity of training stokers. In the old days of cylindrical boilers, anyone could learn to fire a boiler in a short time; now the case is altered. Water-tube boilers are complicated and delicate machines, which require careful stoking and constant attention. An ignorant man may put his rake through a tube and scald himself and everyone else in the stokehold with him.

Under these conditions I think that seamen and stokers should be trained together in a squadron of modern cruisers, with modern guns, and modern water-tube boilers, by which means they would be more up to date when drafted to a sea-going fleet, and the necessity to construct any more vessels with masts and yards for the training service would thereupon disappear.

Fleet Auxiliaries.

The installation of water-tube boilers in the fleet, and the burning of the tubes in many of these boilers, due to defective circulation, caused by the tubes becoming choked by accumulated deposits, has made it necessary to use only condensed water in the boilers. The insufficiency of water provided by ships' distillers to keep their own boilers supplied when continually under steam, and the rapid depreciation of their coal stores in so doing, point to the necessity of equipping all fleets with a powerful condensing-ship.

During the late war the Americans fitted up three vessels for distilling purposes; two of these were not ready before the end of the war, but the want of them was greatly felt. The Engineer-in-Chief of the American Navy, in his annual report, says that "fresh water for the boilers is almost as important as coal," and that "a distilling-ship is an important adjunct of a fleet operating away from a base where fresh water cannot be readily obtained." It is easy enough to fill a cargo vessel with ammunition or coal, and send it with the fleet or to a rendezvous, but for water it is necessary to fit a vessel with tanks and adequate distilling plant, and if we wait until war is declared to do this, many boilers may be burnt before the distilling-ships are ready.

Another class of vessel advocated by Rear-Admiral Melville to be permanently attached to the fleet is a repair-ship. We know by experience how useful our "Vulcan" has proved in this respect in the Mediterranean. With the expansion of the fleet it is all the dockyards abroad can do to keep the squadrons efficient in these piping times of peace. The largest class of work might be done on board a ship as

large as some of the Atlantic greyhounds, and a floating repairing yard of this description accompanying the squadron would obviate the tactical disadvantages arising from the necessity of sending ships in need of machinery repairs back to a yard, and at the same time might be found to be the source of considerable savings in coal and wages, the dockyard being brought to the fleet instead of the fleet being individually sent to the yard.

Mr. Stickney, acting in the dual capacity of private secretary to Admiral Dewey and press correspondent at Manilla, says, in *Harper's Magazine*, that after fighting two and a half hours without noticeably diminishing the volume of Spanish fire, the American squadron hauled off to take stock of ammunition, and devise a new plan of attack, there being only eighty-five rounds of five-inch shell left on board the flag-ship "Olympia," and the squadron having no reserves of ammunition nearer than a home port, seven thousand miles away. Hence the necessity of spare ammunition at hand, a large quantity of which could be carried by a repairing-ship as large as the "Campania," in addition to mines and torpedo-boats of which she might relieve the fleet.

There is no doubt that the introduction of automobile torpedoes has depreciated the value of war-ships when used as rams, but the question is, has it depreciated the value of vessels like the "Polyphemus" and "Katahdin," built solely for the purpose of ramming? I think not much.

That the ram when used effectively is a formidable weapon there is no denying; at the battle of Lissa the Austrian flag-ship "Ferdinand Max," an ironclad of some 5,000 tons, with 5-inch armour extending into the ram, steamed at eleven knots into the "Re d' Italia," and sank her in a few minutes without materially injuring her bows, although the "Re d' Italia" had five and a half inches of iron on her sides. The ram was also used to advantage in the war between Chili and Peru, when the "Huascar" sank the "Esmeralda" without much damage to herself. In addition to these we have the "Vanguard," the "Grosser Kurfürst," the "Victoria" disasters, in each the rammed ship going quickly to the bottom, while the rammer remained on the surface. These are the only collisions of importance between battle-ships of late years—collisions in which one battle-ship has struck another fairly and squarely at any appreciable speed. The ram is used inadvertently almost daily with much effect by many a weary tramp. It is not to be supposed that in the face of modern guns and torpedoes rams could be employed without the chance of damage to themselves; but the ram used effectively should cause more damage to an enemy's ship than it should receive. Rams like the "Polyphemus" could carry as good a submerged torpedo armament as a battle-ship.

In the point of cost, the balance in favour of rams would be considerable. The "Polyphemus," like all experiments, was a costly ship at £174,450; but even at that rate you would have six "Polyphemuses" for a modern battle-ship, and I have no hesitation in saying that in a simultaneous attack made by six "Polyphemuses" on one battle-ship, the latter would go to the bottom. At the present time a ram, in principle similar to the "Polyphemus," could

probably be built for £120,000, with a speed of twenty knots, carrying four 18-inch submerged tubes, and having a good coal capacity. Such vessels would form a valuable addition to a fleet, both for disconcerting the enemy's formations in fleet actions, and for night attacks in conjunction with destroyers, wherein rams could break through such obstructions as booms, and open the way for destroyers. What boom could withstand the charge of a 2,500-ton ram steaming twenty knots? Rams for harbour defence would keep an enemy at a distance, and so would destroyers; but while the latter are easily disabled by a well-directed fire, a ram with all machinery below water, and covered by a protective deck on the level of the water-line, would be a hard nut to crack. Had the Spaniards a couple of rams in Santiago Harbour, commanded by determined men, the Americans would never have kept an electric beam night after night on the entrance of the harbour.

Conclusion.

Having considered the changes of the last twenty years, together with the lessons of the late wars, and having discussed the various types of ships required for a modern fleet in some detail, we arrive at the following conclusions.

We must continue to build armour-clads as ships of the line for the defence of our country and our colonies, to be able to strike a blow at a distance, and prevent depredations on our coasts; for armour-clad squadrons are to the Navy what infantry battalions are to the Army, and nothing has occurred during the last twenty years, or the two late wars, to disprove it. Other nations may build fleets to indulge in the *guerre de course*, but this means of waging war must fall to the ground when the coaling stations are in the hands of the enemy. The coaling stations are the keys of the situation, which can only be held by the nation possessing the superior battle-fleet. With the coaling stations in our hands, the enemy's corsairs must eventually fall into our hands, as Cervera's ships fell into the hands of the Americans, purely from want of coal. Such are the arguments for ships of the line which have decided the issue since men fought for the "Sovereignty of the Seas."

We must build fast armoured cruisers to convoy our merchantmen in war-time, and to hunt down the cruisers of the enemy, that sea trade may not be interrupted, that our population may not starve, and that our merchants may not become bankrupt; for merchant-ships must resort to the convoy, as much to-day as a hundred years ago, as no turn of speed on the part of even an Atlantic liner will prevent her falling into the hands of two or three foreign cruisers acting in concert.

We must build cruisers to scout for the fleet; and on account of the introduction of Q.F. guns and high explosives, these, in addition to armoured cruisers and battle-ships, should be proportionately armoured with vertical side armour over their gun positions or batteries, with a complete belt from stem to stern on the water-line.

We must have rams and destroyers to act in concert with the fleet, and small cruisers and gun-vessels for station work in every part of the world

while British interests are ubiquitous. Irrespective of the fleet, we must have destroyers for flotillas, with stations situated at certain points on our coasts, to oppose to those torpedo-boat stations of our neighbours, and to protect our trade in the Channel and along our coasts from the raids of foreign torpedo-boats. At the same time we require destroyers for flotilla stations at such strategical points as Gibraltar. A flotilla of thirty destroyers at Gibraltar, costing little more than a battle-ship, would certainly deter any fleet from attempting to pass those Straits at night or in foggy weather, and might be a means of preventing the combination of an enemy's squadrons. At all times the presence of such a flotilla at Gibraltar would prevent individual ships of an enemy passing the Straits.

We must have also our fleet auxiliaries, without which in the strain of war a modern fleet would soon become a very inefficient weapon We could not now, like Hughes and Suffren, fight four fleet actions in less than seven months, refitting the squadrons in the intervals. But large ocean steamers, fitted up with workshops and foundries, able to cope with all but the largest machinery defects, would be a means of keeping the ships of a squadron together before the day of battle, by repairing those machinery defects which might otherwise oblige individual ships to return to a dockyard, and would greatly relieve our dockyards on foreign stations both in peace and war. If in peace-time ships in commission have to remain six months at a time alongside the dockyard wall while their most ordinary defects are being made good, what will it be in the strain of war? Without being a Jonah, it is easy to imagine blank despair depicted on the faces of the dockyard officers after anything approaching a drawn battle. It is easy enough for Parliament to vote money to build new ships, and fairly easy to put them out to tender and have them built by contract, but every addition to the standard of the fleet means the same for *personnel* and all the establishments necessary to keep the squadrons efficient. So if we find we have not the necessary establishments abroad to cope with the machinery defects of such large squadrons, we must build floating dockyards to help them out. We cannot afford to rest, else the said rest may spell disaster.

Because individual nations indulge their spasmodic fancies for coast-defence ships, monitors, dynamite cruisers, or *sous-marins*, there is no reason we should follow them. At any rate, it is quite time enough for us to take them up when they have become duly recognised factors in the game of war. Our possessions are so scattered, we must invest our money in vessels with sea-keeping qualities; to build vessels which could not, if necessary, go to sea on a rough day would be frittering public money away. The monitors in the late war effected nothing and hampered the fleet, and Admiral Sampson could scarcely be too strong in their condemnation, while the dynamite cruiser was anything but a success, owing to the impossibility of aiming her projectiles. As for coast-defence ships, whether they be monitors or not, it is difficult to say how they originated, probably in the brains of seaside merchants, who only feel safe when they see a man-of-war anchored off their shores. History

teaches us that war-ships should be concentrated in squadrons that can keep the sea, and that is a better defence than any number of coast-defence ships apportioned to different ports, or sections of coast, where they may be beaten in detail. We did not win the "Sovereignty of the Seas" by building coast-defence ships. While if it is a matter of defending individual ports, the same authority also tells us that earth-work forts are more than a match for ships, and also much cheaper, more easily repaired, cannot be sunk, and last much longer.

Finally, in our war-ship construction, we must beware of inclining too much to any individual peculiarity in our different types of ships, which other nations may build ships to defeat. To build many cruisers with protected batteries of guns, leads other nations to increase their light quick-firing armament to destroy them.

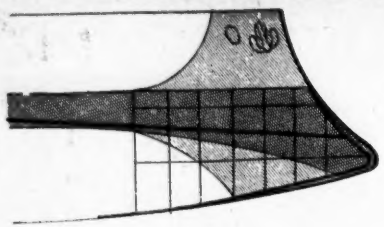
Of all the books to which I have had recourse in writing this essay none have been so useful as "Brassey's Naval Annual," the sea officer's *vade mecum*. The position of benevolent neutrality adopted by the authorities during the recent attacks on that publication was most gratifying, and it would be more gratifying still if the "Annual" were to be found in the officers' libraries of all Her Majesty's ships.

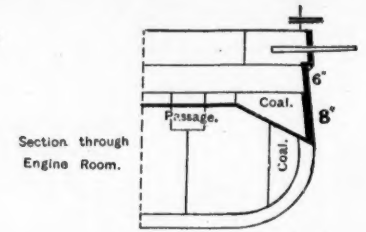
Approaching the end of the tether, I will conclude, not that there is no more to be said, and take this opportunity to confess some things I have written and scratched out, since my object has been to be temperate, fully recognising that although we may have made some mistakes in the past, those mistakes were made for the best, and without the knowledge we now possess from the experience of the two late wars.

[*For profile and deck plans of proposed battle-ship see next page.*]

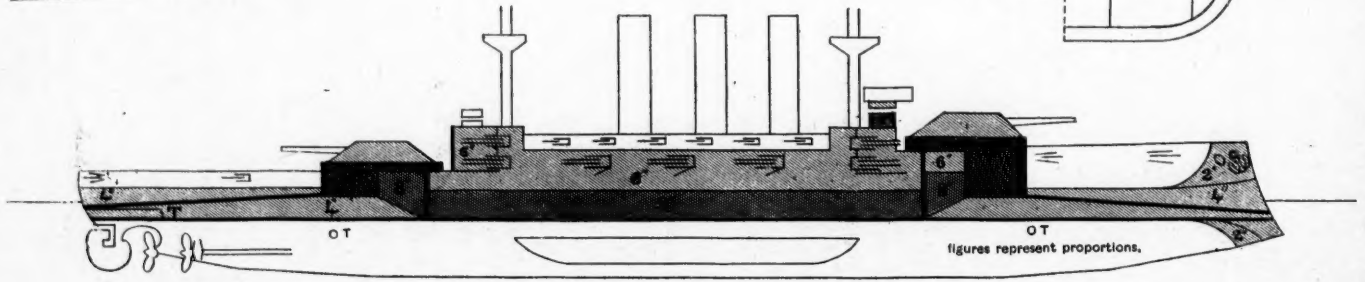
DESIGN FOR H.M.S. "QUEEN."

SKETCH PLAN OF 1st CLASS BATTLE-SHIP, SHOWING
DISPOSITION OF ARMOUR AND ARMAMENT
ACCORDING TO WRITER'S IDEAS.

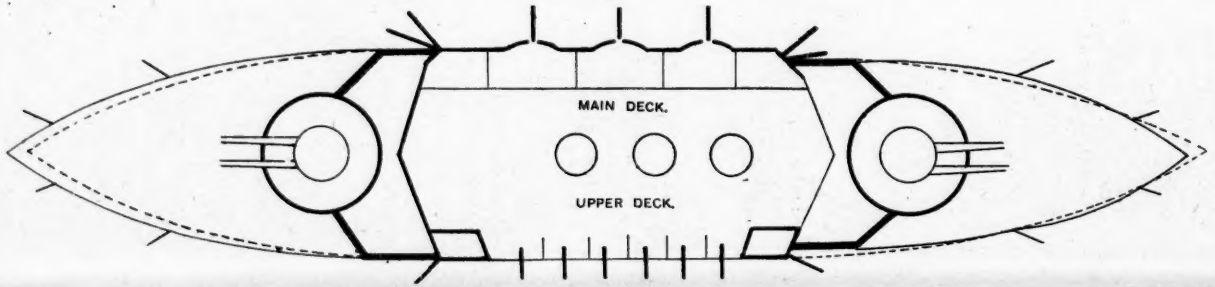


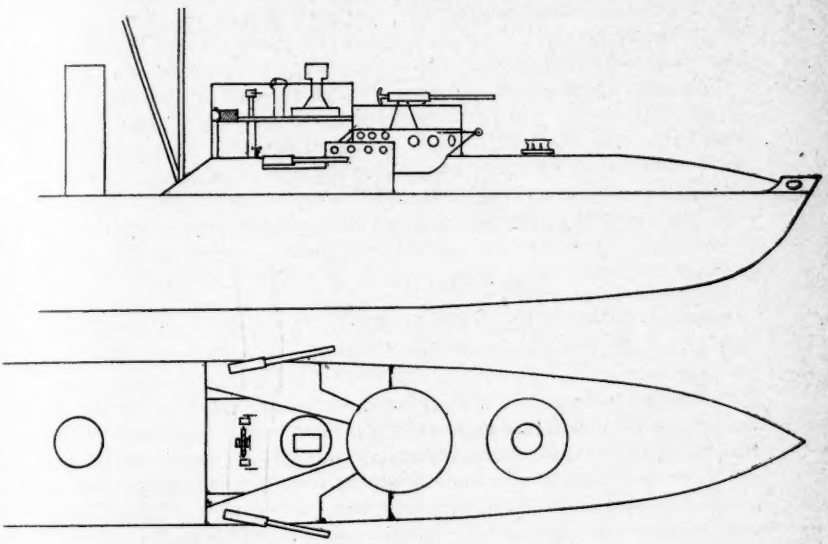


Section through
Engine Room.

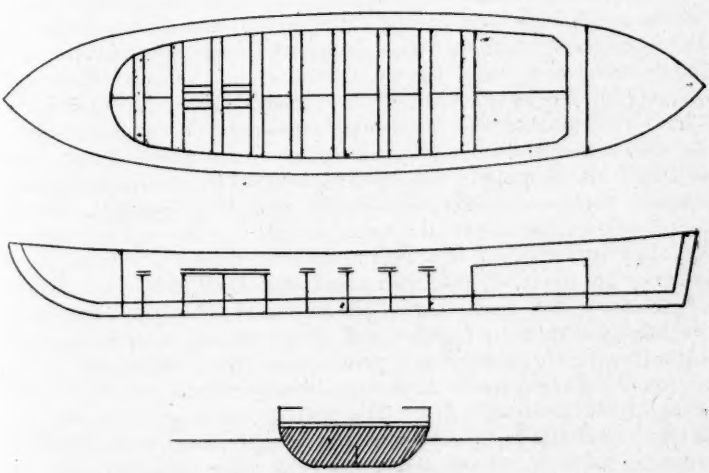


figures represent proportions.





SKETCH-PLAN OF IMPROVED "NAVIGATING POSITION" FOR DESTROYERS.



SKETCH-PLAN OF STEEL LAUNCH FOR WAR-SHIP

WAR MAPS.

By Colonel Sir T. H. HOLDICH, K.C.I.E., C.B., R.E.

Wednesday, 7th March, 1900.

General Sir HENRY W. NORMAN, G.C.B., G.C.M.G., C.I.E., I.S.C., in the Chair.

TWENTY years ago, when I last had the honour of addressing an audience at this Institution, that particular branch of the science of map-making which we call "military" was very much better understood by all our Continental neighbours than it was by ourselves. Already a comprehensive system of illustrating the geography of new countries on a scale sufficient to serve military purposes had been adopted by Russia, France, Germany, and America, all of them very largely interested in colonial developments, which was then in full swing, and which with but few modifications is in existence to this day. That system was based on the employment of instruments of which we had no knowledge in England. Chief amongst these instruments was the plane-table; and the plane-table method of acquiring maps (although it had been perfected by English surveyors in India) was not recognised in England. There was nothing really new about it. It is, in fact, a method at least as old as Julius Cæsar. But so little was this method appreciated by us that I could not even discover a rudimentary example of the plane-table for the practical illustration of the subject—I had to get one made. Now, I am proud to think, every officer who passes through any special course of military training in this country knows at least the theory of its use, and very many of them are most accomplished topographers. This is a great advance; but it is not quite all that is wanted, as I will endeavour to show.

A word or two is necessary as to the reason of the non-adoption of the plane-table system in England, as it might very reasonably be supposed that with a highly educated and most accomplished staff of officials to direct our military surveys there must be something inherently wrong about it for it to be overlooked. The truth is that it was not suited for England, over which country a systematic survey on a totally different principle had already been carried; a system which has resulted in the magnificent series of maps which we know as the Ordnance Survey. And as this survey still progresses in the work of revision, it would be manifestly unwise to change a whole system of procedure of which the results are so manifestly successful.

About surveys and maps of the class of the Ordnance Survey of England I have nothing further to say; indeed, criticisms on my part would be an impertinence. It is to those vast fields of half-explored country which either form an integral part of the British Empire in Asia and Africa, or which so closely border our territories that a military map knowledge of them is essential to our interests, that I wish to direct attention. Here we cannot wait for the costly and lengthy processes which are justifiable in England. Here the governing principles under which we have to work are rapidity and economy; that is to say, that within given limits of time and expense, we are to do the best we can. It is not a question of turning out the most complete geographical illustration of the land surface that science can devise. It is the question of making the most of opportunities that are often too fleeting, and of turning to account every political or military movement that may lead to a gain of geographical knowledge. I do not mean to say that twenty or twenty-five years ago no such attempts were made. Our records of foreign service are full of the gallant attempts made by officers to acquire map information; and those officers learnt more of the countries with which they were dealing, and entered more closely into relationship with the people of those countries, than would be considered desirable in the present day. But they worked on old methods, and with antiquated instruments, and it is surprising what an enormous amount of persevering labour was bestowed on results that would now be considered most inadequate.

Setting aside, then, all that class of mapping which is the outcome of elaborate and expensive survey systems organised in times of peace —which class, indeed, includes the whole continent of Europe, and embraces war maps just as much as civil maps—I will say a few words on the two branches of my subject which seem at present most in want of illustration.

First, What are war maps? Next, How are we to get them?

War maps, or military maps, are obviously those which serve the ends of a military commander either for the comprehensive purposes of strategy, embracing large square areas of country; or for the more local object of illustrating offensive and defensive positions, fields of action, sites for military stations, etc.

In dealing with wide areas to be embraced by an extended plan of operations, military authorities want to know, not only the position of large features, such as rivers and mountains, main roads, and centres of supply; but they want also to know what is practicable ground for manœuvring troops over; the position of every ford, or pass—in short, every local detail which may be turned to advantage either for offence or defence. Large spaces of country may be comparatively unimportant, whilst special accuracy may be wanted only along certain lines; but, in any case, a general geographical map is essential.

Now, if you ask any administrator of the out-of-the-way regions of our Colonial Empire who is sighing for a map of his country and cannot get it, what it is that he wants, he will tell you almost exactly the same thing. He wants to know what are the best lines for prospective roads

and railways; where are the limits of the agricultural and profitable part of his domain; what is the nature of the mountains and forests; what is the varying level of hills and plains above sea; and how he can best strike at any part of his province, where the weight of his administrative authority requires to be felt.

Again, ask the political officer on the frontiers what are his requirements, and there will be no great variation in the reply; chiefly means of communication unravelled; tribal limits; and a few special topographical particulars, added to a general survey. And, if he happens to be a boundary commissioner, he wants accurate ethnographical details, based on accurate topography, along a special line; that is to say, he requires minute accuracy in one part of the map, and general geographical detail elsewhere.

Thus you see that, whilst a war map of a country at large should be based on surveys of an elastic nature, admitting of rigid accuracy in important districts, and of a general geographical sketch in those parts where physical conditions render military movement impossible, we find that the administrator, civil or political, requires almost exactly the same thing; and the boundary commissioner only differs from both in that he would apply the test of accuracy to regions which may not necessarily be considered important by either soldier or civilian, but which, on the other hand, may certainly be of the very first importance. Remember that we are dealing with the question of the first general map of any country—that class of map which is so urgently needed in South Africa at the present moment, and is so lamentably wanting. What, then, is the difference between a civil map and a military map under such conditions? If their interests are separable, where do you draw the line?—and what are we to consider the class distinctions? I have been puzzling over this question for thirty years, and have found no answer. And yet I have known of correspondence, which might almost be called acrimonious, passing between our highest civil and military authorities on this subject, when once the question has been raised Who is to pay? The fact is, that when we are at peace we cannot imagine that we shall ever want military maps at all; but this is a want of imaginative power which does not extend beyond England; there is no other civilised country in the world with military instincts that does not recognise the principle that a geographical map of all country which comes within the radius of military vision is a primary necessity.

I believe that the inauguration of a systematic attempt to attain sound geographical maps of all countries with which we have to do must be based on this one fundamental principle, *i.e.*, that the business of acquiring such mapping is neither civil nor military, but Imperial.

But it is not in England only that there is confusion between civil and military interests in the matter of geographical mapping. It exists in India to this day. Twenty-two years ago, at the earnest solicitation of a surveyor-general, who has left behind him a reputation as a practical military geographer as well as that of a scientific surveyor, a detachment of professional surveyors from the Indian Survey Depart-

ment (which is a civil department) were attached to an army in the field as a sort of scientific adjunct, to pick up new facts about Afghan geography. That such geography could be of the least use to the commander in the field was not in the least anticipated. But even with the disadvantages that attended those early experiments, the waste of time in map reproduction, and in endless references to a chief who was in Calcutta, instead of a chief who was in Afghanistan, the rapidity and certainty of the Indian system of surveying was very speedily recognised, and at the present time no military force of any importance ever takes the field without a survey party attached as a professional unit. Yet still the civil status of the officers employed in this most essentially military duty is always carefully maintained. They are not combatant officers. They may not command their own escorts. They may or may not be recognised by the chief in the field as a part of his staff. This is because the Indian Survey Department is largely a civil department as regards its *personnel* and its objects; and no exceptions can be made in regard to those geographical or military surveys which cover vast areas of the peninsula but pay nothing into the British Treasury.

Assuming then, as I think we may, that the first general military survey of a country is a geographical survey just as useful for civil purposes as for military, on what scale should such a survey be carried out?

I have already pointed out that there should be no rigid adhesion to any dogmatic rule of either scale or standard of accuracy in such work. Herein lies the art of the surveyor. It would be ridiculous, for instance, to make maps of the vast wide desert spaces which border the Nile on the same scale as those of the Nile Valley itself, and it would be equally absurd to waste time and money over all the narrow little intricacies of a mass of mountains which could lend themselves to no possible military manœuvre, as on the important details of the cultivated valleys which they enclose. Nevertheless, we must have square maps which include everything. Blank spaces in maps are an abomination, for they lead to conjecture; so that the first principle of a geographical map which has to be rapidly completed is elasticity of scale. For a general map which is to show roads and communications both important and unimportant, defensible positions such as isolated hills, or deep ravines, river windings and possible crossing places; which is, in short, to guide a general in the movement of large mass of troops, the scale of one inch per mile is generally found sufficient. I have made such maps on double the scale, *i.e.*, two inches per mile for the special purpose of military manœuvres in very intricate country such as exists around Quetta, and in the extraordinarily rough country near Rawal Pindi. The two-inch maps were much appreciated, but there was a final re-action in favour of half that scale, which was found to be quite sufficient for all practical purposes, and very much handier on account of the larger area which was included within a given sheet. Of course, military mapping may run to any scale, but we then leave the general map and approach special maps of position. Such a map as a one-inch map would, in South Africa, for instance, show

every kopje, and every detail of importance. But then South Africa is an ideal country for the surveyor, and there are not many like it. But half that scale, even a quarter that scale, is capable of effecting great things. All the mass of rugged mountain frontier which extends from Quetta to the sea has been surveyed on the scale of half-inch per mile, and the scale is ample to reveal to us a whole array of unguessed-at, unimagined, facts of great importance about a district which had been to us from time immemorial a land of impenetrable mystery. But the normal scale of all our Indian trans-frontier work is half that again *i.e.*, quarter-inch to the mile, and I regard it *par excellence* as the scale for the first military geographical survey of any country which is so far varied in topographical form as to exhibit alternate hills and plains. This means most of the unmapped country of the world. It is capable of great accuracy where accuracy is necessary, and it admits of extraordinary rapidity in delineation in the hands of an accomplished topographer; as you will understand when I tell you that on this scale any really good performer can survey all that falls within the range of his vision as he accompanies a force marching at any rate less than twenty miles a day, and that his out-turn in fairly easy country may be from one hundred to two hundred square miles per diem.

You will say that such surveying as this cannot be of much value. I assert again that a good quarter-inch plane-table survey will meet more than all normal military requirements. It will even serve special purposes. It was long a matter of argument between the Russian topographers and ourselves on what scale the Russo-Afghan boundary maps should be constructed. They held out for elaboration, and the scale of half-inch per mile (or as near it as Russian scale dimensions allow). I had neither men nor time to work anything larger than quarter-inch. The final result was that, though the Russian topographers adhered to their half-inch maps, it was the quarter-inch that finally served diplomatic purposes best, and was adopted as the standard for reference. I may mention that three officers and three native topographers (afterwards increased to five, when special maps were required) completed one hundred and twenty thousand square miles of geographical mapping in the course of that single boundary commission, besides special maps of Herat and the Oxus regions. Descending still further to the one-eighth-inch per mile scale, we still have the possibility of much useful work in open country under conditions in which any larger scale is impossible. I am talking now of surveys, not of mere reconnaissance, but of actual mapping securely based on a framework of points fixed by triangulation, but where triangulation is so scanty, and points so few, that it takes the smaller scale to bring them into the space of a negotiable sheet of paper. Under these circumstances, given a well-trained surveyor, with perfect freedom of movement, and it is difficult to set limits to the possibilities of his out-turn. I have known an exceptional expert at this sort of work, in Eastern Persia, cover upwards of fifty thousand square miles in the course of seven or eight months' journeyings, and absolutely leave no important feature unrecorded.

Granting then that a strategical war map is a geographical map, a civil administrative map, only with special attention paid to certain details, how are we to get these maps? What are the conditions, first of all, under which they can be made? No doubt the condition of free access to a country, and the right to move about it without hindrance, is the condition which leads to the best results. It is under such conditions that the one-inch maps of all the continent of India that does not pay revenue have been completed. Under such conditions a uniform standard of accuracy can be maintained, and that standard should be a very high one. But it is not always possible to secure such conditions, and it is almost always under other conditions that war mapping is most urgently required. Without the actual processes of a campaign in face of an active enemy, there may be deadly hostility to the surveyor; a determination not to allow the veil to be lifted from the face of Nature in such a way as to give advantage should war operations ensue. Where such opposition is organised and systematic it may absolutely prevent further survey proceedings; as is the case in Afghanistan, where there are still a few comparatively unimportant gaps to be made good in our map knowledge to this day. But where such opposition is not organised, as would be the case in many a district occupied by hostile tribes in Africa, and is now the case in many a district beyond our Indian frontier, it merely becomes the normal condition under which we may expect to work. It is under such conditions that a great deal (indeed most) of our geographical mapping in Asia is effected. It demands a special class of workmen—men who know the countries and the people with whom they have to deal; natives, for the most part, who understand the venal working of the Oriental mind as well as they understand the use of the plane-table. About these surveyors we never say much. Their names are not known, and they neither talk nor write anything except their reports. They are specially useful on political missions.

But the one condition which after all affords the most certain prospect of a large accession of geographical map-making, is the actual progress of a military expedition or of a campaign. There is no uncertainty then. The surveyor can go wherever troops can go, and he can even survey a very large extent of country (and this is the point to which I specially beg your attention) beyond where troops can go. It was at first thought necessary that the enemy's country should be securely held before the military surveyor commenced his operations—that he should always act in rear, so to speak, of the advance. No general officer looked to the professional surveyor to give him a map of the country in front of him; and, it must be confessed, that the delay in the reproduction of the field maps when the system of attaching professional surveyors to a field force was first adopted, justified the prevailing idea amongst the military leaders of our frontier expeditions that all they could hope to get in return for the assistance given, and the risks run in the matter of escorts, was a map which, after the whole campaign was concluded, would illustrate the nature of their proceedings. And inasmuch as I am certain that this is still a prevalent idea, I beg permission to enter rather more fully into

the details of this part of my subject than can be permitted elsewhere. What I maintain is this: A good professional workman should not only illustrate the actual course and progress of an action whilst that action is taking place, but he should be able to put into the general's hands a certain number of copies of his illustration, showing precisely the nature and direction of each movement; the position of artillery; the ranges and altitude of each prominent point, and a general roughly contoured plan of the whole position by the evening of the day following the action, provided he has sunlight sufficient to help him in printing his copies. Such illustrative maps as these are of course of a special character, and on sufficiently large scales to suit the subject. More than this. If the country is at all hilly, he should be able to indicate the position and height of the hills in advance to a distance of at least a day's march, noting the lines of drainage, the position of roads, passes, and villages; fixing the relative altitudes of all notable features, and placing it absolutely beyond the power of any guide to mislead a column (even on the darkest night) within the limits of the ground that he can see from the highest points that he can reach. And here I would note in this connection what splendid assistance could be afforded to the surveyor by the balloonist and the camera. But this is so much of "another story" that I must decline the fascinating speculations to which it gives rise.

I do not think that this faculty of surveying ahead of a column is at all understood or appreciated. Many a general is still left to such intelligence as may be gleaned from untrustworthy native sources, or from a reconnaissance conducted along a road from which nothing can be seen, to obtain the necessary clue for an advance or a surprise.

It may be objected that such small scale geographical maps as are the only possible ones during rapid movement can hardly show detail enough to be trustworthy guides to movements over ground as yet untrodden by scouts and held by the enemy. I reply that though the scale of mapping may be small, the surveyor knows and observes far more than can be expressed by the scale, and this knowledge should be at the general's service as much as his map. I will give you an illustration. We were at the back of that magnificent mass of frontier mountains known as the Takht-i-Suliman. We had arrived at the back with much difficulty, over a route which no force had ever attempted to negotiate before. The enemy were on the top of the mountain thousands of feet above us; supplies were short. We had just three days in which to beat the enemy and reach the highest peak of the mountain (eleven thousand three hundred feet above sea), before it would be absolutely necessary to turn our backs on it, and go back again. We all knew what going back through those defiles with an unbeaten foe on our flanks meant. There was only one known way up the scarps and cliffs of the giant Takht, and that way was a narrow one. It was not a ramp, like Dargai, for instance. It was a chimney, a cleft, up which no man could pass without climbing, and no two men could possibly go together. Our guides and our friendly counsellors sat about and grinned, and the people on the top, with their carefully arranged obstacles and their piles of loose rocks, danced their

war dance and hurled defiance at us down the wind. The guides, of course, knew no other way than the way they took exceeding pride in pointing out to us. But the process of running a quarter-inch survey revealed many more facts than could actually be recorded on the paper. The map showed a break in the line of cliffs some three or four miles away, where a landslip occurred, and it showed that a line of drainage must certainly start from under that break and join the main stream at, or near, our position. All this was expressible on paper. But the paper would not show that a few broken juniper trees lined the cliffs above the nullah some two miles from camp, or that the flashing light on the distant weapons of our foes as they danced, a light which could be seen as far as the break in the cliffs, indicated some sort of a pathway between that far point and their main position. The deduction was comparatively easy. We waited till our guides were fast asleep, and then stole out into the nullah bed with a party of four hundred Sikhs. Many weary hours of shin-breaking climbing during the small hours of a nearly pitch-dark night, during which we might have imagined that we were lost, but for those juniper trees, was rewarded when the dawn broke. When the pale yellow streaks of western sky first silhouetted the ragged outlines of Shinghar behind us, and the passing rustle of the cold morning breeze carried along whiffs of pine and fir, we were crawling up over the last slopes of that abominably broken ramp. By eight o'clock, when the first shell whistled up and burst over our heads to warn us that the direct attack had commenced, we fell upon the enemy from behind; and from that day to this the Khedarzais have ceased from troubling.

Once again, in Waziristan, it happened that whilst taking a round of observations with the theodolite from that magnificent peak Shuidar, there crossed the field of the object glass a strange procession of figures, all armed to the teeth, making their way to a comfortable position for an ambuscade in advance of us as we passed through a stiff defile below. With the plane-table it was easy enough to point out a certain and safe line of mountain ridge and spur which a detachment could follow, and which should lead to the ambuscade of the ambuscaders. Thus a double ambuscade was laid, one above the other; and this eventually saved us much inconvenience and trouble, and led to considerable loss to the enemy. But little successes like these are soon forgotten, and it is only when an untrustworthy guide leads a force to disaster that we ask whether it may not be possible to make our own maps and to guide ourselves. It always seems to take a disaster to point a military moral.

But when an active enemy is absolutely occupying the field, so closely hidden as to be invisible, and so active as to outpace the quickest movement of the surveying party; when he is armed, moreover, with the best of modern weapons and knows how to shoot, there certainly does occur a substantial difficulty in reaching positions far enough from the main force and sufficiently prominent to afford good posts of observation for survey work.

I admit the difficulty, but I would point to the map on the screen before you. It is a rough trace (a very rough trace) of the Tirah mapping,

most of which was done under those very conditions. There are between two thousand and three thousand square miles of mapping on the sheet on the one-inch scale, and you will see that it is closely packed with hills, ravines, nullahs, and mountain roads, rendering it almost as intricate a piece of mapping as could well be made in the face of a very pertinacious and active foe. Experts will probably detect a weak point or two, but there is only one of importance, and that was not due to the aggressiveness of the Afridi, but to the fact that one or two marches were made in blinding bad weather, when it was impossible to see the tops of the hills flanking the Bara Valley. All the central part of the map, Maidán, Mastúra, Warán, etc., was mapped by three native topographers, one of whom was a Pathan sepoy with a genius for topography, and a contempt for the Afridi, which we did not all share. It happened that he, working with Lockhart's force from east to west, overlapped the borders of a Gurkha surveyor who was with Hill's brigade in the Kuram. They did not quite agree. The disagreement was almost infinitesimal and of no possible consequence. But they were ready to fight at once in defence of their respective reputations for accuracy, and I was really afraid they would fight. Of course, the native topographer cannot be left to his own devices. He must be directed and supervised by officers who can arrange for his escort; insist on his reaching the point he wants to reach; collect information; observe altitudes; triangulate if necessary, and generally find the means and watch the opportunity for working. This the native surveyor cannot do for himself, and whether you have one or twenty professional topographers in the field there must be superintendence on the part of trained officers, as active and keen as themselves. And there is also the all-important question of escort to be arranged. Happy the man who on these occasions obtains an escort of Gurkha scouts. They delight in the work. Mountaineers and sportsmen from the cradle, they will scatter up a hillside without giving a sign of their existence. They will hold on to secure cover, and protect the plane-tabler from the gradual concentration of long-range fire to the very last minute; then giving the carrier of the instrument a fair start down hill, they will scour down after him in a scattered covey with a rapidity that even the Afridi could hardly match. Unhappy the man who would attempt the same performance with a British escort. The British soldier is not built for it. Boots and rifles and ammunition and want of breath all tell too much against him, and the handicap is not a fair one. This interesting process of surveying in Tirah resulted in the plane-table being twice hit, but nothing worse happened.

Now as to the quality of the mapping so attained. No important road or pass or mountain spur or ravine has been omitted, and as far as possible every homestead in those thickly populated valleys of Mastúra and Maidán has been indicated. But there were so many of them, so closely packed, that I cannot vouch for it that they are all there. The map will at any rate illustrate the soundness of the plan of approach to the country; an approach which led us over three passes, it is true, but which struck at the

heart of the country by the shortest route, and which left us (after the subjection of the Orakzais) with less than two miles of communications to guard between the Arhanga pass and the main camp. You know what happened within these two miles of fairly open route dominated by the pass. Think what *might* have happened had this route been spun out into some twenty or twenty-five miles of enclosed nullahs, as some wise critics suggested that it should have been. Lest you should think that the very rough trace indicates a want of artistic skill, I have pinned up a blue print of a part of the original that you may judge of the quality of the topography. Remember that practically three or four native surveyors completed the whole of it in less than three months.

It is time now to turn to the question of how such mapping is made. I am not going to trouble you with technical details. It is simply topography (plane-tabling) based on triangulation. Consequently, triangulation is first wanted. I have already pointed out that in thickly populated and highly cultivated countries this triangulation must be rigidly accurate, starting from a scientifically measured base, or confusion and litigation will inevitably ensue. Such triangulation (which we will call geodetic) besides serving actual geodetic purposes, should always be the basis of a wide extension of that class of triangulation which supports this topography. It is in fact not only half, but the best half of its justification for the expense and labour bestowed upon it. But this purpose of it is sometimes missed, and it is a curious fact that with a splendid system of first-class triangulation extending through South Africa, from the Cape to the Transvaal, leaving nothing to be desired in the matter of abstract scientific requirements, there are not only no military maps of the Cape Colony, of Natal, or of the Transvaal (except the corner surveyed by Major Grant), but no secondary triangulation on which to base them. Where such secondary triangulation does not exist, survey officers must make it for themselves as they move along. Fortunately South Africa is an ideal country for surveyors. With the accessories of railway lines (which furnish admirable bases) and the advantage of telegraph, for longitude determinations, our war maps should be turned out at the rate of thousands of square miles per month. They *should* be; but it is hardly likely that they *will* be, for we now come to the one consideration which involves the point and the moral of this paper—the consideration of who is to make them.

I have already referred to the necessity for the supervision and leading of trained officers in work of this nature. I need not refer to it further than to say that there is never likely to be a lack of such officers. Even if the great fields which are open in Asia and Africa did not always supply a number of officers with all the necessary experience, the admirable School for Surveying, which now exists at the Engineer headquarters, under Major MacDonnell, would make good the deficiency. But as a matter of fact we have a splendid roll of names of men who have already distinguished themselves in the field of military surveys, and there seems little chance of any such deficiency. There are four officers

at present in South Africa, of one of whom, at any rate, it may be said that he is a past-master of the topographical art. But the best of all good officers cannot make bricks without straw. They cannot cover large areas with accurate and skilful mapping without a staff of *professional* topographers. And where are we to find them? In England they do not exist. In Russia they may be found at Tiflis, and beyond Tiflis they may be found spread abroad through all Central Asia. In India they may be found everywhere. India could not get on without them. In France, in America, in Germany, they are to the front wherever colonial possessions have to be mapped; only in England they are not, and they never have been. Our Ordnance Survey companies do not possess them, for their survey system is different, and their work is not of the nature about which I am now speaking. It is to the fact that we have not got them; and that our generals do not ask for them, because they have no experience of them, and do not even know what they are, that I specially invite your attention.

What is a professional topographer? He is a man who makes topography his speciality and his profession—who devotes his life to it. He may be European or native—each has his special sphere of action—but he is as truly a professional as is the artist who hangs his pictures on the line of the Royal Academy Exhibition. In India they are taken young, and they are often brought up in an atmosphere of map-making, and often the faculty is hereditary. They begin with line drawing and printing as soon as their hands are steady enough to draw. They copy maps for years before they make them. They are next introduced to practical work under efficient training, and for years again may go about the country—a country of mountains and plains, of forests and dales and rivers and thick cultivation, with the plane-table as their companion. Then they get drafted into a survey party on regular pay; or, if they are Europeans who have done their schooling, they pass a fairly stiff examination before they are appointed. Having joined a party in the field they have four or five years of hard topographical practice in the field before they are trusted to draw a fair map. Supposing they are soldiers (as many of them are), they are first selected in their regiments for their natural aptitude at the work; they are then sent through the Rurki schools for survey training, and at the conclusion of the course one or two out of a class of twenty show that they have the topographical instinct in them. These few are then possibly attached to a frontier party, and the real training begins and lasts for some years. Finally, out of fifty who originally started, some four or five turn out to be men of the stamp we want—men who fear nothing but will dare everything; who will explore, and map, and tell the truth fairly often, and not talk unseasonably; devoted to their work, and devoted to their officers. I have said much about the natives and too little about the civil European staff. Amongst them we have had splendid men, men of the stamp of G. B. Scott, of Afghan fame, or McNair, who, alone and disguised, mapped the route from India to Chitral long before our troops ever passed that way, and penetrated into Kafirstan; or Claudius (an Eurasian), who

adopting the guise of a Shikari went on a survey quest to Tirah (though not exactly by the route we subsequently followed) and gave us the key to the gates of it. But these men are all *professionals;* they do one thing all their lives and they do that one thing well. Splendidly appointed as is the Russian topographical staff, I believe that ours in India is better still.

If we possess a trained staff in Asia, you may say, Why not apply them to Africa and the world at large? To a certain extent this has been done. Indian surveyors have done well in Africa already; but it must be regarded as an experiment, not as a system. India has her hands too full of her own work to spare many such men, and under no circumstances can she spare her best men. Every High Commissioner in Africa knows now what professional topographers can do, and asks for them. Already geographical surveys are being started in all directions with most inadequate means. The Surveyor-General in India has found it to be beyond his power to meet all demands, and the Indian Government does not encourage him. "If you have men to spare for Africa," they say, "you have obviously more than you want in India"; and the scissors are forthwith applied to his budget estimate. And it must be admitted that it is most inconvenient to part with good men after all the trouble and expense in training. From my party in India one of the best went to the Amir of Afghanistan, who offered him just ten times the pay that the Indian Government gave him. Another is now a sort of Surveyor-General at Zanzibar, much decorated and in high honour. A third went to the Kashmir durbar, and I saw him no more. Half-a-dozen or so went to Central Africa, and they came back; but they insisted on coming back, in spite of all the temptations of high pay. It is not every Indian who cares for Africa.

If we cannot have Indian topographers, how are we to obtain them? The solution of this problem does not appear to me to be so very difficult, if we are only content to wait. It resolves itself into this: Let us train our own staff of professional topographers just as every other country trains them.

There need not be many of them. A half-company of sappers would amply supply the wants of all Africa if combined (as in India) with a native civil staff. As we have survey companies, railway companies, field telegraph companies, and special companies of all sorts, why not have a half-company of professional topographers? They must be picked men with a special training, and they must be topographers and nothing else. I am not in the counsels of the War Office, but surely there should be no difficulty in the way of starting such a scheme at a time when we are starting so many others. It is not unimportant. A body of men (even five-and-twenty would be of great service), who in times of war could make maps such as I have described to you, and who in times of peace could be responsible for the direction of native detachments all over Africa, would make all the difference in our map knowledge of that vast new world, and keep us at least level with the acquirements of our neighbours. Their training is a matter of detail into which I need not enter

now. In addition to this military force, there should be in every new African province a local corps of native topographers. This is a geographical factor which I hope to see further developed ere many years have passed; for all good authorities agree that certain natives of Africa possess all those natural qualifications which combine to make a good survey workman; and that they take kindly to instruction under European direction. They could be taught, as a commencement, in the Indian schools. I feel sure that the Indian Government would welcome such a scheme, provided that no great expense was involved which would have to be met by the Indian Treasury. But I cannot and need not enter farther into schemes which still require attentive consideration as regards details. They are not ambitious schemes, and they are not expensive; and they are, I trust, practical. If you regard the question of expense too seriously, remember that a few miles of bad alignment may cost as much as a whole line of railway; a boundary based on apocryphal geography may cost a war; ignorance of a few miles of country may cost us battalions and lead to disaster.

Sir CLEMENTS MARKHAM, K.C.B., F.R.S. (late R.N.):—Sir Thomas Holdich has undoubtedly raised a question of very great importance. He wishes to extend to all the Colonies and Settlements under the Crown the great benefit which is derived in India from the excellence of its Survey Department. That Survey Department is now a hundred years old, and during all that time it has been doing most admirable and most difficult work. It was not until lately—and by lately I mean the last forty or fifty years—that the topographical work beyond the boundaries of India was closely attended to; first, by that great surveying officer, to whom the lecturer has alluded the late Colonel Walker. Sir Thomas Holdich has followed in the footsteps of his former chief, and now a surveying party with an army in the field is not only tolerated, but considered necessary. In India, as the lecturer has told us, they have carefully trained native topographical plane-tablers, or topographical surveyors. In several Colonies we have Surveying Departments, but we have no staff of trained topographical surveyors. I think we must all have been astonished at hearing of the want of maps during this South African war, and at the very serious consequences arising from ignorance of the topography of the country; and yet we know that there are Surveying Departments in most of our Colonies. There is a first-class system of triangulation throughout Cape Colony, but no good topographical or military maps. I believe there is even a Surveying Department in the Orange Free State. We had heard so, and we wrote and asked them for the sheets of their survey. With that "slimness" which is peculiar to the Boer they sent us a small, useless, general map which we could have bought in London. Therefore, we do not know whether thay have commenced any survey or published any sheets or not. Now there can be no doubt that it is of the utmost importance to geographers, to administrators, to political agents, as well as to officers in the Army, that there should exist topographical maps by which they can be guided, and that generals should not have to depend upon incorrect information obtained from guides in the country. Sir Thomas has very properly pointed out that the very same requirements are wanted for a military as for an administrative, a political, or a geographical map. That being so, he certainly ought to have the support of all geographers in his endeavours, and I am convinced that the Council of the Geographical Society will give him that support to the utmost of its powers. I cannot believe, now that official eyes are opened to these wants, that he will find great difficulty when he approaches the military authorities on the subject. Anyhow, if he succeeds in his endeavours to establish trained topographical

surveyors throughout Her Majesty's dominions, as well as in India, he will have done a very great and important service to his country.

Major H. T. CROOK, C.E., 1st Lancashire Royal Engineers (Volunteers):—I have been extremely interested in this very able paper of Sir Thomas Holdich. I have made very frequent public appearances as a critic of our Ordnance Survey, and this paper is peculiarly interesting to me, because Sir Thomas Holdich dwells so much upon topography as an art and the necessity of training professional topographers, and the curious thing is that if this paper had been read fifty years ago there would have been a larger number of people in this country able to appreciate its value and the subject of topography than there is any chance of there being to-day. Fifty years ago this nation may have been said to almost lead the world in topography and topographical representation. To-day it is a generation behind the world, and the great difficulty, as the lecturer has said, is to obtain men who are trained topographers, because our Ordnance Survey ceased to be even artistic in the maps which it produces. It started as a Topographical Survey over a hundred and twenty years ago, for military purposes and military maps. What is good for military purposes is good for civil purposes. If it is a good military map, it is good for all civil and geographical purposes. And had the policy been continued, with which the British Survey was started, we should have certainly many more topographers than we have now. But there is another point, that although we started one hundred and twenty years ago with topographical survey, at the present moment there is no uniform topographical survey of the British Islands yet completed. The style has been changed, the process with which the map is produced has been changed, and the work is extremely discordant, inharmonious, and in many parts of the kingdom thoroughly inefficient, and some of the new maps are the worst that have ever been produced. Some few years ago it became part of the examination of officers, when they attained the rank of major, that they should undergo an examination in the field on their faculty in reading maps, identifying points of localities and positions distant and close at hand. In many districts in this country an officer has been taken out for an examination of that kind, where there has been no map in which the features of the country are correctly delineated. The position of the places, geodetically speaking, is correct, and the hill sketching, the drawing and representation of the ground, or what is left of it, is quite capable of being understood; but certainly it would be impossible for an officer to identify many distant points from the map which was before him in such places as Cheshire, for instance. I agree cordially with Sir Thomas that this matter of topography is a professional matter, and that a man requires to be thoroughly well trained, but it goes further than that — that when you have your maps you want to have men able to interpret them and read them quickly, and unless you have the topographical materials and the good maps you will never have good topographers, you will never have men who can readily comprehend the situation and the ground. Sometimes the knowledge of topography, that is, the comprehension of ground, comes almost intuitively to a great many people; to others it can only be acquired by the study of good maps which represent the features of the ground. A man versed in topography recognises the character of the country he is in, and even without a map has an intuition of what he will see a few miles in advance on either side of him. An ordinary man, an officer, or whatever he may be, who requires to use maps, needs a certain amount of training in reading them. Therefore we want not only to train professional topographers—and I hope we shall see them trained in this country—but we want also schools of topography such as they have in France and Germany. If we look at our military books and atlases that come out, we see they are simply scandalous. Take any recent book that has been published, the translation, for instance, of von Hoenig's "Life of Cromwell," the maps in that are simply abominable, as they are in Dr. Gardiner's

"History of the Great Rebellion." This is an exceedingly interesting subject to most of us, and yet the maps with which to follow that campaign are lamentable. There are really no good topographical representations even of the ancient battle-fields, which are so numerous in this country. I do hope, Sir, that this lecture will do something to stimulate the study of topography, and also to bring before the authorities in this country the necessity of really restoring the topographical section of the Ordnance Survey, which, of course, is the one we must depend upon for the education, not only of topographers, but of people in their appreciation of topography. It is no more necessary for a man to be a professional topographer to understand maps than for a man to be a professional musician or professional artist to understand music or pictures.

Mr. A. SEDGWICK WOOLLEY:—I should like to say a few words in regard to the remarks of the lecturer that "the first general map of any country—that class of map which is so urgently needed in South Africa at the present moment, and is so lamentably wanting." That it has been wanting by the military authorities is true; but whose fault was it? The maps were procurable, yet were not got by the Intelligence Department. Maps of the Orange Free State have been made; every farm has been trigonometrically surveyed, and every drift, kopje, farm-house, pan, and stream is shown on those maps. I can vouch for this, because I am a Kimberley surveyor, and I have had a good deal to do in the Free State in reporting upon diamond and gold discoveries. About three years ago a Johannesburg syndicate employed me to report on a long line of gold reefs which exist about forty miles to the west of Kroonstad. I told them they had better procure any maps they could from the Orange Free State to assist me in making my plans and report. They sent to the Government mapmaker at Bloemfontein, Mr. Herffst, and he supplied them with large scale maps, which showed the whole topography of the districts required. Afterwards I was interested in an endeavour to obtain a concession for a line of railway from Kimberley to Bloemfontein, and we got the maps from the same quarter by simply paying for them, and they showed everything in the districts from Kimberley to Bloemfontein, such as would be wanted in a first general map of the country, quite enough for military purposes. I think, in the first case, some £40 or £50 were paid, and in the other probably £70 or £80 for the maps. The different district maps of the whole of the country could be obtained thus. Sir Clements Markham has referred to the map which was sent by the Orange Free State to the Geographical Society. I have seen that map, and I notice that everything of importance is carefully left out. Probably it was sent as a present, and therefore they thought they would not supply any information; but private individuals could get those maps by paying for them. Therefore, the question comes in, as Sir Thomas Holdich says, Who is to pay? If private individuals, merely for the purpose of making money, can get them, why should not the Government have got them? Perhaps they thought that maps were of so little importance that it was not worth while obtaining them. We in Kimberley told them, the authorities, three years ago that we were going to have a fight with the Orange Free State, and we were laughed to scorn. I do not, however, want to enlarge upon that, as it is foreign to the paper. When Sir Charles Warren came out I put myself into communication with him, as I happened to have had the pleasure of working under him as Assistant Boundary Commissioner in the Bechuanaland expedition, and he wrote and asked me whether I could give him any maps of the Orange Free State. I had certain maps myself, and through a commercial institution in Cape Town, which lent money on properties, I obtained other maps which supplemented the whole of the maps of the Free State, and those maps were reduced and connected in one map by some mapmakers in Cape Town, and they are the Intelligence Department maps of the Orange Free State which are now being sold at Stanford's. They are, as preliminary maps of a country, I think, quite sufficient for military purposes, and without them I do not believe that Lord Roberts would have known the De Kiel

Drifts and the drift at Waterfall, on the Riet River, or those at Rondewal and Klip Drift, on the Modder. These were all shown on the maps. I, with other surveyors and men of experience of the country, said four months ago that the only possible plan of attack was to make a flank movement on Bloemfontein in that direction; but our generals had no maps showing the drifts and easy nature of the country. Had they had those maps, which are made to a scale of about half an inch to a mile, a compilation of them would have helped them out of their difficulty. It would have shown what they could do in the way of a flanking movement. It certainly would have been impossible to make a flanking movement without cavalry or mounted infantry, but it would have shown the absurdity of attempting to make a frontal attack with infantry over a river fifteen feet deep, such as the river below the Modder River Bridge. I see that Sir Thomas Holdich has left out the question of the use of the prismatic compass entirely. I myself am a great believer in the prismatic compass for preliminary survey. When I was on the Boundary Commission, we used the theodolite for primary triangulation, which we supplemented with the prismatic compass for fixing minor points and the plane-table for filling in. The plane-table is a most excellent instrument for filling in, but for rapid work I believe in the prismatic compass very much. I was the Secretary of the Bechuanaland Land Commission, and after the settlement I particularly pointed this out to our Administrator, Sir Sidney Shippard, and our Surveyor-General, when they wanted to give out some forty-four farms along the border of the Transvaal for military occupation. Our Surveyor-General was an old naval man, and he ridiculed the idea that you could use a compass with any degree of accuracy on land. I assured him that I had used it a great deal, and that though I knew there were kopjes where ironstone existed on which a compass could not be used, still, as a general rule, you could get very accurate results with it for preliminary work. I got them to agree to it, and I made the preliminary survey of those forty-four farms entirely with the prismatic compass, and pacing. The Surveyor-General said he would allow me in each farm of 3,000 acres an error of 300 acres either way, but when they were actually surveyed with the theodolite we found the error as a rule only amounted to about forty or fifty acres, an inappreciable difference on a scale of half a mile to an inch. Therefore I say that the prismatic compass is a very excellent instrument, and I was rather astonished that Sir Thomas Holdich had not mentioned its value for rapid work. Another matter I would touch upon is the use that can be made for rapid work in sketching roads. Wherever I travel by cart in South Africa, I always make road sketches, because you generally have drivers, either Dutchmen or natives, whom you do not care to talk very much to, and it fills up your time, besides forming a most useful record. I use a field note-book, lined with ordinary blue lines, and count the lines as two minutes apart. Wherever you start from, you put down the time, and sketch the road as you go along, marking all details for each two minutes, and from that you get a very good idea of the country. I have the whole of the road thus sketched from Modder River Bridge to Koffyfontein, with the drifts and cross-roads and every little kopje marked, marking with blue pencil anything in the nature of a water-course or a river, and with a red one the hills, and giving their approximate heights. In that way, where you have maps already made, as we have, of the whole of Cape Colony, the Orange Free State, and the Transvaal, military officers could verify and amplify them for military purposes by driving about the country and filling in details by road sketches.

Colonel G. E. CHURCH (late U.S. Army):—The sound reasoning of the paper and the thoughts which it evokes, recall to my mind my own modest military experience in the Army of the Potomac and elsewhere. In Virginia, our ignorance of swamps, forests, creeks, and rivers was such that we lost many thousands of lives in our efforts to reach Richmond by the way of the peninsula. In general, where ignorance prevailed as to the country which we wished to invade or defend, our armies were not always organised to suit geographical or topographical requirements, and upon

our generals devolved the heavy task of trying in face of the enemy to correct the errors which had been made at headquarters. I have listened to the previous speaker with a great deal of attention in regard to what he says of the prismatic compass. I have done a great deal of work with it myself; but in connection with an odometer, which is simply an instrument with a wheel for measuring the length of a road. Supplementing the plane-table with it, I should say that the two instruments would serve to map any area of new country for military purposes. I have no doubt that, under certain conditions, the plane-table would be superior to the odometer and the prismatic compass; but the plane-table, I take it, would be better in a rough, dry, little-forested country. A plane-table map, of course, grows under one's eyes, but if you have many rainy days you lose a good deal of time; while, with the odometer and compass, you can run along whether it rains or not. I have mapped hundreds of square miles with an odometer with great rapidity. I should say that in a new region where one is undisturbed by an enemy, a man could do the field work for a shilling a square mile, and doubtless for more or less the same cost with a plane-table. Therefore one fails to understand why we recognise it to be the first duty of an army corps to study geography in face of the enemy, at great cost of blood and money, when, with two or three topographical engineers, we could map the district at an infinitesimal cost before war commenced. Every day, in this broad Empire, some flash tells of frontier friction and the imperative need of a thorough knowledge of the geography of the land where it occurs. How easy it is to obtain that knowledge in time of peace! Who can estimate its cost in time of war? The thoughtful paper of Sir Thomas Holdich, so full of valuable suggestions, seems to show us that geography is perhaps the primary factor of victory in all important campaigns, and that more attention should be paid to a subject which has heretofore been too much neglected in military education.

Mr. J. Bridges Lee:—In common with all the previous speakers, I have listened with the greatest pleasure, satisfaction, and admiration to this lecture. I feel confident that a lecture of this kind at this time cannot fail to do an immense amount of good. It is one of the most lamentable features in connection with this war that some people, at home at least, should believe that there has been perhaps a certain amount of unnecessary loss of life because we have no satisfactory maps of our own territory. I thoroughly agree with the lecturer in all that he says about the extreme rapidity and excellence of the Indian work. No doubt Sir Thomas is probably the greatest, certainly one of the greatest, of living experts in the matter of rapid survey and accurate map-making; and there can be no doubt in the mind of anyone who has ever observed the work of a native topographer in India that the work is done in a very rapid, careful, and accurate manner. When one sees those Ordnance Survey maps for almost any part of India, one is surprised to find how few errors there are, and how remarkably accurate the map is with regard to everything that is mapped. But when this has been said, of course, it must always remain a fact that the most perfect map ever constructed must lack a certain number of details. It is impossible that any man can map all the features. He will map all the features which appear to him to be important, and an experienced topographer will probably select without much difficulty, and with very little doubt, those particular features which are generally of the greatest importance, but it is impossible that he can exhaust them all. It is impossible for him to foresee what particular little pieces of information it might be desirable to have which may be missing from the map. Whenever anything is missing by the methods which are at present ordinarily used, it is always necessary to send somebody off to the spot to fill in the deficiency. It is not always possible, however, to send people there just at the time the information is required; certainly in time of war that cannot be done. When the enemy are occupying a considerable part of the country you can only make use of such maps as you have got of that part of the country or anything you can see from points of vantage you are able to reach. I make these remarks with the object of leading up to what I have to say with reference to other means which can

be used besides the plane-table. As is noted at the commencement of this paper, the plane-table had a very uphill battle before it came to be recognised by English surveyors as *the* topographical instrument *par excellence*. Many methods in other matters have been a very long time before they have been able to force themselves to the front and obtain recognition. The subtense method, for example, for measuring distances is very generally used now, but met with a great deal of opposition before it came to be at all generally used among our surveyors. In India nearly all the work has been done for a long time with a plane-table, based, of course, upon triangulation, and no doubt if we could get these plane-table topographers to go to Africa they would be able to do equally good work to the work they have been doing in India. But there is another large portion of British territory in which a great deal of excellent survey work has been done of recent years, namely, Canada. Very large tracts of Canada in the North-West District, through the Rocky Mountains, the whole of the Yukon District, the borderland of Alaska, have been surveyed, and, I believe, almost entirely by the aid of photography. The Surveyor-General, before adopting photographic methods, carefully considered other methods, which were tried. He had carefully weighed the whole matter, and tried numerous experiments, and he found the photographic method in some of those districts enabled him to survey the country with much greater rapidity and economy; and I believe it is generally admitted that the maps which he has made are not, at all events, deficient in accuracy. What I rather wish to suggest by way of commentary upon the lecture is, that when we are going to work in a new region like Africa, where almost new maps would have to be made, we ought to avail ourselves of all means which are certainly sound and good means of working, and, besides inviting aid from India, it would be good policy and facilitate the manufacture of these maps, if we were to invoke aid also from Canada. No doubt, at the present moment, there are in Canada a number of highly intelligent trained surveyors who have done an enormous amount of work in the way of mapping land from photographs. Supposing the country was surveyed primarily with a plane-table, as in India, under all circumstances it would be advisable to have a sort of collateral photographic survey, if it were only for the purpose of collecting a complete record series of photographs of the country. A map by itself never can give to a general the complete information he wants; a map is a projection on a plane, and will give distances from point to point along that plane, and if the contour lines are filled in accurately, then, with a fair amount of computation and measurement, you may, perhaps, be able to make out how much up and down there would be, and what the distances would practically work out at. But if you have photographs which give the elevation and the aspect of the country over which you are passing, if the photographs are survey photographs, not ordinary photographs which are incapable of interpretation, but survey photographs made in such a way that they can be interpreted with certainty, and if you know exactly the places where they were taken, they would convey an immense amount of additional information supplementing the information which you obtain from the map. I am not wishing to make this an occasion for giving an address on the methods of photographic surveying—it is a big subject—but to suggest, for the consideration of Colonel Holdich and all who may be interested, that we ought, considering the importance of the subject, and how absolutely necessary it is that we should have good maps, how much depends upon it, and how little by comparison is the cost of the map by the side of the lives of the people and the loss of material, to avail ourselves of all means which are known and have been proved to be efficient. We ought not to drill all our English surveyors in one school, and one school only. India is the best school; we have had the best survey officers from India; we have had much the best topographical work done in India; but still it is not the only school. Canada is another, and it may be hoped that one of these days we may have a good school in England. We might found a school in England at least for the interpretation of photographs. And supposing at this present moment we had in our

possession complete sets of survey photographs taken from known stations in South Africa—photographs taken under certain prescribed conditions which it is not necessary to enter into details about now, it would be possible, in an incredibly short space of time, to plot the whole of that country, and at any time when anything was found to be missing from the maps, most of those details could be filled in as required, without any necessity for revisiting the ground.

Colonel Sir T. H. HOLDICH :—I need not reply very much to the gentlemen who have so kindly taken part in the discussion, but I can hardly agree with Major Crook in his very strong criticisms of the Ordnance Survey Maps. I think we should remember that they are made for a special purpose, and that they meet that purpose fairly well. That purpose is not comprised entirely in the matter of military manœuvres. As a matter of fact, an ideal military map of England would, perhaps, be a little more useful to our enemies than it would be to ourselves ; so that we need not deplore its absence if, as Major Crook thinks, such a thing does not exist. From what Mr. Woolley has said about the surveys in the Orange Free State, a large amount of what would be called in India revenue surveys have been made ; but in order to turn them into useful topographical maps it would be necessary to compile them with very great care on some comprehensive scheme of triangulation. I did not gather from Mr. Woolley that such triangulation has been carried out over the country to enable this to be done. Mere cadastral surveys are not sufficient to furnish what I understand by a general topographical map which would be useful for military purposes. As regards the use of the prismatic compass, I purposely did not enter into details of the instruments that are used in making maps in India ; but I may say that we do make use of the prismatic compass pretty largely in circumstances in which the plane-table cannot very well be used. Mr. Bridges Lee is an authority on the subject of photo-surveying. I take great interest in the subject myself, because I believe there is a great future before it. The difficulties at the present time I consider to be more or less connected with technical details, and I think that no doubt they will be overcome, and I expect to see photographic surveying very largely developed in future. He will be pleased to learn, perhaps, that of the officers who have gone out to South Africa for the purpose of making surveys, one is a Canadian, an officer of engineers who has had the whole of his training in Canada.

The CHAIRMAN (General Sir H. W. Norman) :—We have been very much interested both in the lecture and the discussion, and I cannot but think that during the course of the reading of the paper our thoughts were very much directed to the disasters, as they may be called, which we think have arisen from the absence of good maps in Natal. When we consider, as the lecturer has told us, how very easily and quickly surveys can be made for military purposes, even in a very difficult country, and how very little they need cost, it seems marvellous that we had no proper maps of Natal, as far as I know. We have seen lots of maps in the newspapers, but they seemed to alter from day to day, as I do not think the country has altered ! Who is responsible for this lack of maps ? It is not our business to inquire, and if we did we should not be able to find out. The present system of military administration is so extraordinary that we might go backwards and forwards from pillar to post, from that wonderful Defence Committee to the Secretary of State for War, or the committee sitting at the War Office, or the Colonial Governor, or the Colonial Secretary of State, or the Treasury, and we should never find who is the person responsible for it. But I do trust that, after the terrible example we have had of neglect on the part of some department or departments, we shall take warning, and in future have military maps—certainly in a country like Natal, that we have occupied for some fifty odd years, and where, during the last few years, we have anticipated war. Certainly there was time to make a survey. I will now ask you, ladies and gentlemen, to join me in thanking very heartily Sir Thomas Holdich for his admirable paper.

AN ITALIAN VIEW OF THE BOER WAR.

By General Count LUCHINO DAL VERME.

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Translated by Colonel C. NEEDHAM, Military Attaché to the Embassy at Rome.

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PART II.

AT the commencement of the new year there was a truce between the two belligerent parties. It was a real truce consequent on reverses suffered by the English in the middle of December at Stormberg, Magersfontein, and Colenso. The British forces in South Africa must have mustered 120,000 men on 1st January, without counting the three divisions about to leave England, or already on their way, and not including the Yeomanry, the Volunteers and the fresh contingents from Australia and Canada. These forces were divided in three districts, under the command of Generals Buller and White in Natal, of Lord Methuen on the Modder, and of General Gatacre in the centre, south of the Orange River.

Ladysmith, Kimberley, and Mafeking were all besieged, but still holding out. The new Commander-in-Chief, Lord Roberts, and his Chief of the Staff, Lord Kitchener, who had landed on 10th January, were secretly preparing the plan of campaign, which was to be developed in February, when sufficient troops would have reached the Cape for the invasion of the Orange Free State, and their food supply should have been organised. Suddenly the Boers attempted a *coup-de-main* on Ladysmith. The enemy, who, conscious of their inferiority in numbers and of their special aptitude for defensive action, had never, in the whole course of the campaign, taken the offensive, now decided on an assault of the besieged town. The Boer leader must have calculated that of the number of troops sent from Europe a portion would be given General Buller to enable him to march to the relief of Ladysmith. One can understand his anxiety to take the place by storm before assistance could arrive; but the attempt was more than bold, it was rash, for it meant attacking a garrison that could bring 10,000 rifles into action.

On the right bank of the Klip River, which runs by Ladysmith and then joins the Tugela, and a little more than two and a half miles south of

the town, a plateau some 800 feet above the level of the valley extends about the same distance westward, and is known by the name of Cæsar's Camp or Waggon Hill. On the night of 5th January the Boers climbed up to this plateau without their shoes, in four separate columns, and reached the top almost simultaneously about one in the morning. The outposts at Cæsar's Camp were surprised, and fell back; but on Waggon Hill there happened to be a detachment hard at work bringing up a naval gun. A disorderly conflict ensued: shots were fired in every direction, without any particular aim; troops from the nearest pickets, and afterwards from the town, aroused by the sound of firing, arrived on the scene. When dawn broke the position was untenable. The English, in two detachments on the two divisions of the plateau, were separated by a ridge. The Boers had taken shelter under the crest of the hill, and were fully determined to hold it. It was impossible to move across the open without being hit, and every man fell who made the attempt. At length, after repeated efforts by the companies that arrived in succession from the town, after a series of valiant deeds by young officers, who were all acting independently of orders from their seniors, and, above all, by the opportune action of a battery so posted in a wood near the river as to play on the assailants (this was the only tactical move devised and executed throughout the day), the Boers, towards evening, retired down the slope and disappeared.

There had been heavy, if disorderly, fighting on both sides for seventeen hours. The bravery of the men won the day. Four companies of the Gordons and one of the Rifles finally swept the plateau clear of the enemy with a bayonet charge, which left 43 of the Highland company alone upon the field. In the same way three companies of the Devonshires cleared the foot of Waggon Hill of the formidable enemy, who had climbed it by night, and held it the whole day in the face of successive reinforcements, and in spite of the shrapnel from the artillery near the Klip. According to the English account, 200 Boers were disabled, though the latter only acknowledged a small loss. Thirteen officers of the besieged force were killed and 31 wounded; 143 men were killed and 226 wounded.

The Boers, having failed in the assault, did not repeat the attempt. On the other hand, General Buller decided on attacking the enemy again. He had been reinforced by Warren's division, which had recovered from the defeat at Colenso on 15th December. His first attempt by frontal attack having failed, he decided to try a wide flanking movement from the west. On the night of 16th January he sent a brigade to make a feint on the left bank of the Tugela, at Potgieter's Drift, and the following day he despatched three other brigades, with a battery of howitzers and some naval guns, to Trichard's Drift, six miles up stream. The enemy made no sign. Warren's division, having crossed to the left bank, was in front of a line of hills with steep slopes, extending several miles north-west. These are the foot-hills of the chain stretching from the Drakensberg between the Venter Spruit, an affluent of the Tugela, and the Sand, one of the tributaries of the Klip. The movement was commenced on the 19th, but

was delayed because the slow and cumbrous transport could not keep up with the troops. A fresh start was made on the morning of the 20th. General Warren advanced towards Taba Myama, the most accessible point in the line of hills. Five batteries were massed, and the infantry were directed towards the shelters[1] hastily erected by the Boers, who had not time, as at Colenso, to dig the trenches, in the construction of which they are so skilful. But the shelters made of stones or heaps of earth are quite enough to afford cover to the marksmen, and this is always considered essential in any preparation for defence made by these stolid people. The ground was much broken by ravines, small hills, and scattered rocks, which formed endless obstacles to the attacking force, and afforded good cover to the defenders. The troops began the advance about eleven, not as at Colenso, in line of columns, but, having learnt a lesson from their adversaries, in open order, taking advantage of the inequalities of the ground, until they reached an open plain extending about 1,500 yards in front of the enemy's line. There they were ordered to halt and await news from the cavalry brigade, which had been sent to the extreme left at Acton Homes, and there they remained that night, the whole of the next day (the 21st) and the following night, till the morning of the 22nd. Fighting was going on more or less the whole time, but except on the first day, when the English were able to advance a little way, no success was achieved, notwithstanding the five massed batteries, which could not silence the enemy's guns. Nothing more was accomplished on the 22nd, though twelve more guns and four howitzers were brought into action, but their fire was apparently ineffectual.

While this was going on at Taba Myama, orders were given to take possession of Spion Kop, an isolated, flat-topped mountain, the highest in the chain, and which might be considered the key of the position, for it was the only spot from which the trenches at Taba Myama could be enfiladed. The Boers had been able to make these trenches while the English were lying inactive, and all the efforts of so many battalions, supported by artillery, were as ineffectual against them as they had been for three days against the "schansjes."

Eighteen companies were sent to attack Spion Kop by night, following one pathway which led up the southern slope. It was dark and rainy. The men, obliged to march in single file, took two hours in the ascent. When the head of the long column reached the summit, the picket was surprised and dashed off to give the alarm. Day broke, and the English found themselves exposed to the fire of at least six guns and to incessant "sniping" from an enemy who seemed to be posted everywhere, but was nowhere to be seen. This fire lasted a good three hours. The Boers advanced slowly, and the English as slowly gave way. From time to time they regained some ground with a bayonet charge. Then two regiments arrived to reinforce them. Later on more troops came up, but for all that the Boers would not leave the plateau. By evening there were six English

[1] These shelters are called in Dutch "schansjes," and must not be confounded with trenches, which are actually works of field-fortification.

battalions on Spion Kop, where, in the morning, there had hardly been room for two and a half to manœuvre. Though such numbers massed on a small space of ground could not deploy, they formed a splendid target for the fire of the enemy's rifles and of two Maxims, to which latter were due the greater part of the losses sustained by the assailants.

There was great confusion among so many regiments, and the supply of drinking water failed. A mountain battery was sent for, but never reached the summit. The naval guns were requisitioned, but could scarcely get to the foot of the hill; it was impossible to haul them up it. Lastly, the commanding officer, not knowing what to do next, sent for a working party of 600 men to dig trenches. During the night Colonel Thorneycroft, who had taken command when General Woodgate was wounded, decided on evacuating the position. The losses had been severe. There were no guns to oppose the enemy's rifle and artillery fire. It was impossible to get any troops to advance across the open, and had there been more the enemy's fire would have been still more deadly. There was no drinking water, and but little ammunition. All these circumstances induced the commanding officer to take the serious step of ordering a retreat, though he had six battalions at his disposal. The retirement was executed in perfect order during the night, and on the morning of the 24th Spion Kop was clear of the English. On the 25th Warren's division recrossed the Tugela, and on the 27th all was over. The English had buried 27 officers and 246 men north of the river; they had carried off 1,109 wounded, of whom 53 were officers, and they had left 7 officers and 340 men prisoners with the enemy.

This second attempt was made after a month's quiet, undisturbed preparation. It lasted several days, and failed at the very moment when it was said the troops had gained a footing on positions from which they could have marched unhindered to the relief of their besieged comrades; 87 officers and 1,700 men had been lost without any result. This caused intense disappointment in the Army, in England, and throughout the Empire. The situation was not much improved by Sir Redvers Buller's despatch, in which he announced that he would resume the attack, and relieve the town within eight days. This was considered on the Continent a boast of the unlucky general's, but was probably published on purpose to prevent the enemy pressing the siege more closely, and from sending troops to defend the Orange Free State against the forces Lord Roberts was concentrating on the Modder. The relief of Ladysmith was always kept in view.

The despatch was justified by subsequent events. On 5th February—just eight days after Warren's division had returned to its original camping-ground—General Buller sent one brigade and five batteries, supported by the fire of the naval guns, to the famous Potgieter's Drift, while another brigade was sent further east to the Skiet Ford, to occupy Vaal Kranz. The former movement was a feint, the latter the real attack, which succeeded, after a short engagement. But the Boers, who had at first been deceived by the feint, and had disputed the passage at Potgieter, causing considerable loss to Lyttelton's brigade,

no sooner discovered the real line of attack than they brought all their forces to the position at Vaal Kranz occupied by the English, who eventually had to retire.

Sir R. Buller's telegram to the Commander-in-Chief explains what happened :—"Having occupied Vaal Kranz, it was necessary to fortify the position, so as to make it a pivot for further operations. After two days' work, I found the nature of the ground would not allow of this ; besides which, we were exposed to the fire of heavy guns posted on heights dominating our artillery." Once more it was the nature of the ground prevented an advance, and Buller's men recrossed the Tugela, and for the third time camped in their original positions.

Meanwhile the commandoes that blockaded Ladysmith, and at the same time opposed the English troops that for two months had been trying to relieve it, were still occupied with their double duties, for which they were none too numerous. From reports on the battle of Colenso, it appears that the Boers engaged there cannot have numbered more than 10,000, perhaps only 8,000, while not more than the same number can have remained near the besieged town. It is impossible to say how many men they lost; they always returned their losses as insignificant, while General Buller's force in the three unsuccessful engagements at Colenso (15th December), Spion Kop (17-26th January), and at Vaal Kranz (5-8th February) lost 3,226 men.

The greater part of General Joubert's force was employed on the Tugela. Though the English could not gain any decided advantage, on the other hand, the British troops on the Modder were increasing in numbers, and it was with these Lord Roberts intended to carry out the new plan of campaign, the invasion of the Orange Free State, and, as a natural consequence, the relief of the besieged towns and of places occupied by the enemy.

On 2nd February, the Highland Brigade, the 9th Lancers, and one battery, all under the command of General MacDonald, had been moved to the Riet, a day's march west of the railway. This was the first move, made to distract the enemy's attention, for Lord Roberts was concentrating the force destined for the real attack to the east of the railway. He had instructed General French, who commanded three cavalry brigades, three horse batteries and the mounted infantry, to cover the march of the 6th and 7th Divisions, and on 9th February he himself arrived at Modder Camp, where he established his headquarters. He intended to turn the position at Magersfontein, held in force by the Boer general, Cronje, since 12th December, and to cut the enemy's line of communications between Bloemfontein and Jacobsdal. This was announced by the English press in the beginning of February, and was precisely what happened.

The situation was changed since the time when Sir George White had been compelled to fall back from Dundee to Ladysmith, before the overwhelming hosts of the enemy, and when even the superiority of British troops had been unable to overcome the formidable Boers. There were now nearly 130,000 men under Lord Roberts's command in South Africa.

It is true, 20,000 of them were inactive on the Tugela, and 12,000 in Ladysmith; General Gatacre was still in Cape Colony, holding in subjection any British subjects inclined to revolt, and, at the same time, fronting the Boers who occupied Colesberg and Stormberg; a good many troops were stationed on the line of communications, but for all that the Field-Marshal knew he could count on nearly 45,000 men for the invasion of the Orange Free State. Amongst them was a considerable cavalry force under General French, who had been recalled from the centre, where, since no other general made any move at all, he had gained the reputation of being a dashing leader. On 12th February his cavalry division occupied Dekiel Drift on the Riet, some twenty miles south of the junction of that river with the Modder. The following day, the 6th and 7th Infantry Divisions crossed the river, while General French seized another ford on the Modder 25 miles to the north, and captured three laagers. One of his officers seized a third ford, where two of the enemy's camps were still standing. At the same time, the infantry brigade from the Orange River moved to Ramdam.

The troops employed by Lord Roberts in the initial movement consisted of three and a half infantry divisions, including that of Lord Methuen, who had not moved since the reverse at Magersfontein, besides the cavalry division and several horse and field batteries, the whole being estimated at 50,000 men, but we may say there were 45,000 in the field.

Meanwhile, General Buller was preparing to cross the Tugela for the fourth time, with the double object of preventing the enemy from making a last desperate attempt on Ladysmith, before rallying for the defence of the Orange Free State, and of making another effort to relieve the town. As he had tried to cross the river, once at Colenso, and on two other occasions by the fords upstream, and all these ventures had failed, he now turned eastward to a ford below Colenso; but here it was essential to gain possession of group of the hills described on the map as Hlangwana, which, though on the right bank of the river, were still held by the Boers. None of the English military critics have been able to explain why General Buller, before attempting to cross the Tugela on 15th December, had not occupied these hills, which rise from the south bank of the river only six miles from his camp, nor, stranger still, why the English did not know that the position was held by the enemy. It was most important to gain possession of them, for it was from there that columns on their way to cross the river could be enfiladed. This actually happened to companies and batteries, which were exposed, not only to rifle fire, but to that of two guns on the ridge of the southern hill. It was only in the middle of February, two months after the battle of Colenso, that Buller thought of dislodging the enemy from a position almost contiguous to his camp; on the 14th, he sent a battalion and a battery to occupy the approach to the position; three days later he advanced; the Boers made but a feeble resistance, and the English, with very slight loss, easily captured Cingolo and Monte Cristo, while the enemy crossed to the other bank of the river. On the 19th, Hart's brigade marched into Colenso, which was found to be

unoccupied, and the troops wereable to commence crossing the Tugela without hindrance.

The unusually weak resistance of the Boer leader indicated his intention of leaving the district. The investment of Ladysmith appeared to slacken. This was the first effect of the strategical movement commenced on the 18th by the Commander-in-Chief, between the Riet and the Modder.

The defensive action of the Boers had evidently assumed the character of a rear-guard engagement. It was fortunate for them that the country over which the English had to advance was broken and woody, so that they could prolong the defence, even when during the next few days they had small numbers available, part of their troops having been sent into the Orange Free State by Reenen's Pass. These reached the new field of action with marvellous rapidity, but they were few in number and only arrived when the situation of the Boer leader had become desperate. It so happened that Cronje, having delayed at Magersfontein, managed to slip away from French's squadrons, and march north of Jacobsdal towards Bloemfontein. On reaching Klip Drift, the rear of his column was attacked by Knox's brigade, which captured one of his convoys. The same day (16th), General French left Kimberley, where he had been hailed as a liberator on the 15th, and set out in pursuit of Cronje. The enemy had been dislodged and the race began. At Paardeberg, the main body of Lord Roberts's advance guard was attacked by Commandant Delarey, who had come from Rensburg, beyond the Orange River, and who was repulsed. The English continued to advance and Cronje to retire, with his force well in hand and threatening reprisals if attacked. French's cavalry pushed forward on his flanks, the infantry divisions, for the first time in the whole campaign, made forced marches, following the enemy as he retired along the Modder, until he reached Koedoesrand, where he camped and entrenched himself.

On the morning of the 18th all the troops that had taken part in the pursuit advanced to the attack on the right and left, from both banks of the river, and a general engagement ensued. There was hard fighting all day long, without any advantage to the assailants. The Boers maintained their positions, and the English, who were far superior in numbers, suffered the greater loss; the following day they had recourse to bombarding the camp in order to obtain some definite result. The moderate bombardment on the 19th and 20th had no effect in inducing the fiery Boer to surrender. The fire of six field batteries, one howitzer battery, of the naval guns and Maxims, had to be concentrated on the laager, and it was only three days later, during the whole of which time this torrent of shot and shell had been poured into the unfortunate camp, that Cronje, to avoid a useless slaughter of his men, offered to surrender unconditionally. Lord Roberts received the vanquished general and kept him and his 3,000 men prisoners, sending the women and children to their homes. There was but little booty, only five small guns, and the number of prisoners was comparatively small. But the blow had been struck—the master stroke that cleared the road to the capital of the Free State, that

had raised the siege of Kimberley, that would relieve the towns in Cape Colony from the Orange invasion, and would necessarily cause the relief of Ladysmith. All this happened on 27th February, the anniversary of the disaster at Majuba Hill in 1881. The state of joy throughout the Empire was indescribable, and reached its climax when the further news arrived of the relief of Ladysmith—news that had been so long anxiously expected, and so long delayed.

After crossing the Tugela, Buller's troops had advanced a couple of miles, but on the 23rd one of those unfortunate incidents occurred which had so often to be deplored in the course of the campaign, but which passed almost unobserved in this hour of triumph. The Inniskillings, with two companies of another regiment, attacked the position of Railway Hill, a little to the south of Pieter railway station. The Boers fell back under cover. The English advanced without reconnoitring the ground, when suddenly the leading companies were exposed to a murderous fire from the Boers entrenched close by. The colonel, a lieut.-colonel, three captains, and several men were killed. The English retreated, leaving the wounded, both officers and men, in the hands of the enemy for thirty-six hours. They requested and obtained an armistice of forty-eight hours to bury the dead.

Sir R. Buller, seeing that things were again going wrong, tried another ford further down stream, which was crossed by the remainder of his troops on the 26th. The following day General Barton made an attack on Pieter's Hill, not far from the scene of the disaster to the Inniskillings on the 23rd. Having learnt a lesson from the enemy, he prepared the attack with well-placed artillery, and probably reconnoitred the ground to his front. The Boers were at the final stage of the rear-guard fight, which they had so pluckily maintained for thirteen days, with ever-decreasing forces; and so the attack was successful, and allowed the rest of Warren's division to crown the principal heights. The English took 60 prisoners.

Sir R. Buller telegraphed on the morning of the 28th that a strong body of the enemy remained on Mount Bulwana, and that he was preparing to drive them off before marching to the relief of Ladysmith. There was no occasion to do so. The Boers had for two weeks been sending off stores and baggage with detachments to the Orange Free State, and few of them remained. These few disappeared on the night of the 27th, so that the evening of this second day Lord Dundonald was able to march his Colonial cavalry into the town. The Boers had cleverly concealed the reduction of their forces from the English, and had thus been able to prevent sorties from the town, and to impede Buller's advance. This is proved by the message heliographed from Ladysmith on the 27th, a few hours before the besiegers left:—"This afternoon the Boers, having been reinforced, are trying to retake," etc. They only left behind them two guns, probably the very two which they fired up to the last moment, to make the English believe the siege was being continued. They left some provisions, but not a single prisoner, with the exception of some wounded, who could not be moved. One cannot understand why Sir R.

Buller, in his telegram of 1st March, should allude to "a far more complete defeat than was expected." He must have presumed it to be so, because he found no trace of the enemy. The Boers were compelled to leave, and they left exactly at the right moment, without being hindered, harassed, or disturbed in any way.

If an important object was attained, it was the infallible consequence of the strategic plan devised by Lord Roberts, and the veteran fully deserved all praise for the performance. The enthusiasm of the Anglo-Saxons, after four months of defeat, disappointment, and anxiety, was quite excusable. It rose to a pitch of delirium in London, and one might have fancied oneself on the lively boulevards of Paris, or beneath an Italian sky, rather than in the London fog, amid the serious inhabitants of the English capital. The close of the century has shown how all nations rejoice alike over their victories.

In order to complete the sketch of events in the first ten weeks of 1900, an account should be given of the various engagements that took place in the centre where General Gatacre, aided by General French and his cavalry division, had been in command since November; but it would be difficult, and certainly tedious, even to enumerate these events, which are not essential to forming an idea of the progress of the campaign. Suffice it to say, that in this district the chief object was to keep in subjection the population of Dutch origin disposed to make common cause with the Boers, who had crossed the Orange River, occupied Colesberg and Stormberg, and were continually raiding between Rensburg and Arundel, though restrained in their political and military action by the rapid movements of General French. There were many encounters in this restricted theatre of war, but none of other than local importance. But there was a repetition of what had happened more than once since the beginning of the war. On 12th February, during the retirement from Rensburg on Arundel, two companies of the Wiltshire Regiment, which had somehow been forgotten, were made prisoners. Even in this district the effects of the strategic movement on the Modder soon made themselves felt. The Boer commandants speedily evacuated the towns they had occupied, and recrossed the Orange River to assist their fellow-countrymen, and avoid being cut off by Lord Roberts's corps marching eastward. We have seen that one of these leaders, Delarey, was able to fight the head of the English column at Paardeberg, though without avail against superior numbers.

Mafeking, far away in the north, has never had any influence on the progress of the war. Its gallant commandant, Lieut.-Colonel Baden-Powell, was still holding out when the latest news arrived at the beginning of March; he has with him a small Protectorate force and some mounted police.

The action of a preponderating force in the Free State was the principle of the plan of campaign, when Sir Redvers Buller was sent to the Cape. When he gave up this principle there was a general impression that the Government in London had insisted on his at once relieving Kimberley and Ladysmith, for the reinforcements that arrived during the

first half of November were sent partly to the Modder and partly to the Tugela for that purpose. This was a serious mistake, and was recognised as such by military critics on the Continent and by the English press. Results proved how prejudicial it was to the success of the campaign; the troops sent to reinforce those on the Modder and Tugela achieved no success. Nothing was accomplished until a veteran commander appeared upon the scene, aided by an experienced Chief of the Staff, who could first collect an efficient force capable of moving independently of the railways, and could then direct operations in accordance with the immutable principles of strategy, without attending to objects of secondary importance, which can always be attained by the completion of the strategic scheme.

Lord Roberts fully deserves the gratitude of his country, not so much for having decided on the invasion of the Orange Free State, which had been planned by others previously, but for carrying it out rapidly, taking advantage of the reinforcements that arrived, without detaching any, either to Natal or to Cape Colony. At the proper time, and without informing anyone, perhaps not even the Government, he removed General French and his cavalry from the Colony, knowing they would be invaluable in the scheme he had devised, for the general had proved himself an able and enterprising leader, perhaps the only one, from the beginning of the campaign.

It cannot be said the Field-Marshal's idea was exactly identical with that suggested for his predecessor. According to the original plan, when there was no possibility of moving, except near the railway, the invasion was to have commenced from Naauwport, whereas now he made his concentration on the Modder. It is true that to move on Bloemfontein by the Modder long marches were necessary, and therefore a well-organised transport was essential; but evidently the Chief of the Staff, with all his experience in the Sudan, had calculated he could manage it, though it was no easy task to provide for 50,000 men and as many horses, even for the few stages between the railway lines at Kimberley and the Orange River. Results have proved, at least up to the present time, that his calculations were sound. There were many advantages in making Modder River the secondary base of operations. It was supplied by the branch line from De Aar; it avoided the necessity of forcing the passage of the Orange River where it was held by the Boers, instead of crossing it where the English were in possession of the bridge; there was the facility for relieving Kimberley, which was most important for many reasons, not the least of them being the release of the omnipotent Cecil Rhodes. This did not affect the plan for carrying the invasion into the heart of the Free State, for the bridges at Norval's Pont and Bethulie were turned, and the road to the capital was equally open. It is needless to repeat that all the mistakes made in the field of strategy at the beginning of the campaign were thus entirely rectified. These errors were universally recognised, even by those who had committed them, perhaps through the fault of others.

There was not so much progress made in the field of tactics; it might almost be said that little profit had been derived from the experience

of the first engagements. Confining remarks to the fighting on the Tugela, for the action on 6th January, near Ladysmith, was merely a disorderly struggle, which it would be difficult to criticise, and because at present the tactical development of the battle at Koedoesrand, on 18th February, is unknown; it is a remarkable fact that a reconnaissance of the ground was hardly ever made before the action commenced. At Taba Myama, at Spion Kop, and at Vaal Kranz, battalions were sent forward without any idea of the nature of the ground on which they would have to deploy; batteries were advanced without any previous knowledge of their probable line of fire. The same thing happened in February at Grobler's Kloof and Railway Hill, yet these places lie between Colenso and Ladysmith, and the surrounding country must have been well known, for the latter is a camp of instruction.

The natural consequences were, that in spite of the bravery of the men, and especially of the officers, who were always the first to give an example; in spite of the superiority in numbers, which was sometimes excessive, as at Spion Kop, the English were never able to advance, but always obliged to retire. In the fourth engagement, which was only successful because the Boers had reduced their force to a mere screen for covering their retirement, the neglect of scouting before the attack, and of the proper formations for the advance, caused the disaster on 23rd February, when nearly all the officers and many of the men were killed in two companies of the Inniskillings, who had boldly advanced in the old-fashioned way. This happened in a woody, mountainous country, on ground broken by ravines and covered with rocks, ground on which the Boers had been for months teaching the English how to defend and how to attack with the minimum of loss. After the reverse at Colenso, the appearance of the ground should have suggested a method of advancing similar to that selected by the enemy for defence, that is to say, an advance made by successive trenches and by works of field fortification.

Memory reverts to twelve years ago when, after the disaster at Dogali, in Eritrea, General San Marzano was ordered to re-occupy Saati, and with only 14,000 men had to make head against King John's entire army of 80,000 warriors. He advanced slowly, making trenches every day, and supporting them with portable metal towers, and thus in three weeks he reached Saati; he was safe from being surprised or overwhelmed by the number of the enemy, whom he finally obliged to raise his camp, to give up the enterprise for which he had called the whole of Abyssinia to arms, and retire to his mountain home. Had General Buller adopted this plan, after the failure at Colenso on 15th December, there is no doubt he would have succeeded in reaching Ladysmith long before 28th February, and would have been spared the necessity of making other attempts, not to speak of the loss of many valuable lives. In order to carry out the advance in this manner, soldiers of all arms, and not engineers only, should have worked every day, and for several hours a day, at making trenches. Now it is doubtful whether English soldiers would have submitted to doing this manual labour every day, when we remember that on

the last day at Spion Kop, when the position could not be held, though there were so many troops that they could not be usefully employed, all the available working parties of the engineers were sent for to dig trenches for the infantry. These men returned to camp without ascending the hill, for on the way up they met the troops who had evacuated the position. If it was necessary to dig trenches, the question naturally arises why the infantry soldiers could not have dug them for themselves. The answer is very simple: the men had not any tools; the tools are loaded on carts which remain in the rear and never leave the roads; the English soldier, as has been said before, carries very little, and does not like carrying that; he is too much accustomed to Indian and colonial wars, where he is relieved of all unnecessary work, which he believes—and for the prestige of white races in India it is well he should believe it—is the business of the native population.

The exigencies of transport, together with the aversion of the English soldier to carrying loads, and his habit, and that of the officers, of making himself comfortable everywhere, had a pernicious effect on Sir Redvers Buller's operations in January. When he tried to relieve Ladysmith by a wide flanking movement to the west, Lord Dundonald's cavalry brigade was the only one that marched rapidly. Warren's division, hampered by the cumbrous transport and by the habit of making short marches, took six days to cross a ford, unopposed by the enemy, and accomplish marches that should have been done in two. The Boers had thus ample time, not only to take up new positions, but to dig trenches, so that when Warren attacked—first, Taba Myama and then Spion Kop—he found the same difficulties of a frontal position as if he had not made the flanking movement; there was the additional disadvantage of the men arriving more weary and less well provided than if they had resumed the attack at Colenso. In the Orange Free State the great misfortune of the Boers was that the Field-Marshal and his Chief of the Staff had organised a new system, breaking away from the old customs. Having arranged a proper transport independent of the railway, which did not exist during the first months of the war, they made the infantry march as they had never marched before, not paying much attention to whether the men and officers had their regulation baggage with them every day. By this means they were enabled to pursue and capture Cronje and his 3,000 men.

Our ideas on the Continent are very different from those of the English as to the length of marches and the privations soldiers must endure at the decisive phase of a campaign; for instance, a well-known English military critic considered it a remarkable performance for French's cavalry division to have marched seventy miles in five days, or rather under fifteen miles a day; again, a correspondent at Jacobsdal, to give an idea of the privations during the march across the Orange Free State, telegraphed:—"The men had nothing to eat but boiled beef and biscuit"!

No doubt the men would have been glad to get this boiled beef and biscuit, so much despised by the correspondent, on the hard days they had to go through during the rest of the campaign; it is quite certain

General French made his cavalry march much further than the critic supposed, both then and later on; he had been training them for months, while he was fighting with more or less success in the south.

It is difficult to form a judgment on the management of the artillery during the first two months of 1900; its task was an easy one at the bombardment of Cronje's laager; it is not yet known why no decisive result was obtained in General Buller's engagement north of the Tugela, especially from 17th to 24th February on the heights of Taba Myama and Spion Kop, during which time the five batteries at Three Tree Hill were unable to silence the enemy's guns, or to drive the riflemen from their trenches, nor could they support the battalions that had to retire. Possibly this was due more to the bad choice of a position, owing to ignorance of the locality, than to inferiority in guns or bad practice. Certainly the Boers seemed to employ their few guns with far better effect than the English; take, for instance, the two Maxims directed at the battalions massed on the summit of Spion Kop.

Kimberley and Ladysmith are relieved; Colesberg, Rensburg, and all the places occupied by the invader in Cape Colony are clear of the enemy. All this is due to Lord Roberts's march with a preponderating force through the Orange Free State, which is now the centre of operations. The Field-Marshal is advancing on Bloemfontein, and the enemy have tried in vain to bar the way once on 7th March, astride the Modder at Poplar's Grove, where their left wing was outflanked by French's cavalry, and they had to beat a hurried retreat; and a second time at Driefontein, on the 10th, when 16,000 Boers made an obstinate resistance, and did not retire until they had inflicted severe loss on the English.

The Regular troops with Gatacre and Clements, and the Colonials under Brabant, who have crossed the Orange River at Norval's Pont and Bethulie, will join Lord Roberts's force. He will then have with him 60,000 men, and will command in South Africa some 200,000.[1] He will undoubtedly be victorious. The Boers will fall, but they will fall as they have fought, like brave men. They were only once beaten—on 27th February at Koedoesrand; and even then, though the victory was of great moral value, it was the defeat of a detachment, not more than one-twelfth of the whole contingent. Even if Cronje and his men had

[1] The permanent English Army in time of peace may be calculated at 220,000 men; deducting 70,000 for India and 20,000 for Egypt, Malta, and Gibraltar, there remain in the United Kingdom 130,000. Mr. G. Wyndham, speaking in the House of Commons on 1st February, stated the force in South Africa to be 180,000 men, with 452 guns. Lord Lansdowne, in the House of Lords on the 12th, said they were about 200,000, of whom three-fourths were sent from England. 71 battalions of Militia were to be mobilised to fill up vacancies; of these, 30 went to the Cape. It is calculated there were 16,000 Boers between the Tugela and Ladysmith, 8,000 near Kimberley and Magersfontein, 8,000 in Cape Colony, and others dispersed about the country. So that before Cronje's surrender there cannot have been more than 40,000 under arms. It is not known, and never will be known, how many of them were killed or disabled by wounds. The English losses up to 3rd March were by official accounts:—Officers killed, 182; wounded 585; men killed, 1,593; wounded, 7,108; officers missing, supposed to be prisoners, 138; men, 3,191.

escaped, the mere presence of Roberts's army on the Bloemfontein road was enough to clear the enemy out of Cape Colony and relieve Ladysmith.

It is now well known that the Boers began to leave their positions near Ladysmith on 14th February, when the first news of Lord Roberts concentrating his troops reached them. A telegram from Ladysmith of the 17th says that for three days convoys had been seen going towards Dundee, and that parties of Orangemen had left for the Free State. This information, and news received later of successive departures up to 27th February, prove that they were due to the strategic movement in the Orange Free State, as the military correspondent of the *Times* clearly states on 7th March:—"The public credit General Buller with having relieved Ladysmith, whereas it is Lord Roberts who has relieved Buller and Ladysmith at the same time. If he had not marched on Bloemfontein, General Buller would still be making pertinacious but vain efforts to reach the town, and paying a dear price for those efforts; the unfortunate garrison would still be living on half rations, and suffering the bitterness of hope deferred. Without the intervention of Lord Roberts, the Boers would still be masters of the northern districts of Cape Colony, for it is evident that there, as in Natal, we have been fighting only with the Boers' rear guard, in both cases covering the retreat of their main body, which was executed in perfect order."

If General White and his men displayed admirable soldierly qualities, if General Buller, though persecuted by bad luck, proved himself both firm and perserving, what shall we say of the Boers, who, wedged in between the besieged and the relieving force for four months, kept the former shut up in the town, and prevented the latter from going to their assistance? These peasants, all soldiers between fifteen and sixty years of age, managed, without being skilled artillerymen, to keep up the blockade of three towns; they continued to occupy extensive districts and flourishing towns belonging to their enemy, fighting all the time; they beat the stout English Regulars in several engagements, and took 130 officers and 3,000 men prisoners. They did this in spite of reinforcements that arrived during the whole of November, December, and January. The English Government kept pouring thousands of troops, collected from every part of the Empire, into South Africa; it was only when the force was complete, and a general appeared on the scene, who knew that the war must be carried into the open plains of the Orange Free State, where his troops could act and where the Boers could not display those tactics that made them invincible in defence—it was then only these peasant soldiers were beaten. But they were beaten by odds of fourteen to one, after having held their own against the whole British Army for weeks and months, against forces four times their superior in numbers.

The struggle of giants with which the century closes will be recorded in indelible characters in the history of this heroic nation. The Boers may disappear before hosts of armed men, but they cannot fail to rise again in more favourable times.

The Prussian General von der Goltz, who organised the modern Turkish Army, has written a clever article in the *Militär-Wochenblatt* of 3rd February, in which he compares the Boers to the Turkish soldiers of the "Ilave," a kind of half-drilled Militia:—

"The Boers, notwithstanding what was written to the contrary in the English press, before the war began, have preserved the simplicity, the endurance, and the courage of a primitive people. Their continual contact with nature and the dangers incurred in their desert life have tempered their fibre, developed their intelligence and initiative, and strengthened their self-reliance. Perhaps their strong religious feelings cause them to take less account of human life than the civilised nations of Europe. Their patriarchal constitution, with all its obligations, which are strictly observed in families and villages, preserves a rigorous discipline in every community. This explains the success which the two little Republics have obtained over the world-wide power of England, to the astonishment of our contemporaries."

President Kruger was thought to be making a vain boast when he said, at the beginning of the war, "We shall astonish the world," but his words have come true.

(*To be continued.*)

THE INTENDANTUR SYSTEM OF THE GERMAN ARMY.

[COMMUNICATED.]

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THE ARMY CORPS COMMANDER.

THE commander of each army corps administers through his staff the whole of the Services of the Army within his command, including even the audit of the accounts. Each army corps submits its own estimates and has its own money allotted to it. The corps commander is responsible for the proper expenditure of that money. He is equally responsible for administration, for recruiting within the area of his command, for the feeding, clothing, and housing of his troops, for their training and instruction, for passing them into the Reserve, and for the payment of pensions.

His staff consists of a military branch and an Intendantur, with minor branches for military law, religious worship, and veterinary science.

The Intendantur provides the general commanding an army corps with technical assistance in all non-military subjects.

DUTIES OF THE INTENDANTUR.

The scope of the duties of the Intendantur are laid down in the Cabinet Order of 1st November, 1820 :—

"In every general's command an administration is to be established which shall have unfettered command over all the non-combatant

branches of the Army in the district—the commissariat, hospitals, clothing depôts, and pay department—and the officials at the head of this administration will be personally responsible for all irregularities which may occur in the non-combatant branches in the command. This administration will be called the Intendantur. The Intendanturs will be the sole channel of communication between the War Office and its departments and the non-combatant branches."

The duties of the Intendantur now include: finance duties of every kind, the preparation of all estimates, accounting and audit, inspection of pay offices and selection of paymasters; the supply of provisions, the keeping of reserve stores; the supply of cloth and materials for clothing and equipment; the administration, repair, and erection of buildings for the troops; and, on mobilisation, the arrangement of all matters connected with the administrative services.

From a British standpoint the Intendance of a corps would be represented by a portion of the audit division of the War Office, a part of Pimlico Army Clothing Department, the Army Service Corps, the Pay Department, the administrative portion of the Medical Staff, and the barrack division of the R.E. Establishment.

The Corps Intendant.

At the head of the Intendantur stands the Corps Intendant.

The Corps Intendant has a twofold position: he is the chief of a department, but he cannot issue orders to the troops in reference to his department except after consultation with the general. He may report the general's decision to the War Office.

He has powers of commanding officer over all his subordinates. He is represented in each division by a Divisional Intendant.

The Divisional Intendant.

The Divisional Intendant is subordinate to the divisional general, and his relations to him are the same as those of the Army Corps Intendant to the Army Corps General. He controls the pay and allowances and all accounts of the troops, equipment, and clothing matters, and takes part in the inspection of all clothing, equipment, and arms of the troops. He has limited powers of jurisdiction.

The Personnel.

The *personnel* of the Intendantur is drawn from the following classes:—

a. For higher officials:—

1. Officers who have served six years.
2. Reserve officers with proper qualifications.
3. Retired officers (for clothing).

b. For secretariat :—

1. Soldiers serving who have a first-class educational certificate from a classical or modern school.
2. Non-commissioned officers of twelve years' service with excellent character and good education.

c. For clerical staff :—

Military candidates with good civil references.

For all classes there are courses, examinations, and probationary periods.

The officers of the Intendantur are classed as Militär-Beamte (military officials), and not as Army officers. The names of the higher classes appear in the Army List. They have relative rank, more for the purposes of social standing than for any military object, and are assistants and advisers only, as regards their departments, when they come into relation with the combatant branches.

Divisions of the Intendantur.

The Army Corps Intendantur is divided into five sections :—

1. Kassen-Abtheilung—finance and general administration.
2. Natural Verpflegungs-Abtheilung—provisions and forage.
3. Bekleidungs-Abtheilung—clothing.
4. Garnisons-Verwaltungs-Abtheilung—barracks, furniture, gas, etc., and buildings.
5. Lazarett-Abtheilung—hospitals, pensions, and invaliding.

I. *Finance.*

The duties of the first section (Kassen) comprise general administration and finance. The estimates are prepared and the accounts audited by it. The estimates are sent in on the 1st October, and sanctioned in the Budget which appears early in January ; the new account is commenced on 1st April. The money for the ordinary recurrent administrative expenditure is allotted in bulk. As the army corps are not moved about, and the number of men, etc., varies but little, the preparation of the estimates is a simple matter.

The Corps Intendantur may sanction any building operations up to 30,000 marks (£1,500). Anything beyond this has to be referred to the War Office.

About seven officials and a few clerks are employed on audit (see p. 797). Under this section are the paymasters. The German paymaster is practically paymaster and quartermaster. In addition to providing the companies with cash, he keeps an eye on the clothing stores, the regimental tradesmen, the food of the men, the preparation of clothing, and the purchase of materials required by the troops. On the march he looks after the baggage. For the number of paymasters and their assistants see p. 798. The men are paid in the presence of, but not by, a regimental officer.

II. *Supply.*

The Natural Verpflegung section corresponds to the supply services of the Army Service Corps. It undertakes the supply of food and forage. It determines whether the contract system or direct purchase is to be adopted for each. Supply by contract is the rule, the contracts usually being drawn up for the delivery of certain articles for a certain time for a fixed price. Direct purchases are made by a committee consisting of two officials. As a rule, bread and forage are the only articles furnished to the troops from the Intendance magazines. The bread is made in military bakeries, and the men employed in them form the cadres of field bakery columns; they have previously done a year's service with the colours.

There is no free ration, except bread, given to the men in peace-time. A battalion messing fund is formed of 1½d., deducted from each soldier's pay, of the breakfast allowance, three pfennig (under ½d.), and of the compensation for dearness of provisions, average 1½d., together with the proceeds of the sale of refuse, and is managed by a regimental committee. It may be noted that a full field ration is calculated to cost 1½d. for bread and 7½d. for meat and groceries. Provisions are obtained either by direct purchase of single articles or by contract, or the assistance of the Intendantur may be asked to procure them at cheaper rates.

In the field the officials of this section are in charge of the field magazines, supply columns, etc., transport for which is furnished by the train battalions.

The chief Intendant official in war-time is called the Intendant-General. He receives instructions from the Chief of the General Staff through the Inspector-General of the Lines of Communication. He is represented in each army by an Army Intendant.

The Army Corps Intendant becomes Field Intendant, but performs the same class of duties as in peace-time.

For supply purposes each Field Intendant has the following transport at his disposal:—

1. Six provision columns, each of twenty-seven 4-horse wagons carrying rations for men.
2. Six wagon columns, each of sixty 2-horse ladder-sided wagons usually carrying stores other than rations—corn, hay, straw, etc.

These columns together carry four days' complete supplies for one army corps and half a cavalry division.

3. One field bakery column of twenty 4-horse bakery wagons.

III. *Clothing.*

Each corps has a Pimlico, or Army Clothing Department, of its own, managed by a committee of retired officers. (For numbers see p. 799.) From it cloth, shirts, and boots, which it purchases by contract, are

drawn. The units practically buy of this department, as each commanding officer of a regiment, or its equivalent, has a lump sum allotted to him for clothing, camp equipment, musical instruments, etc.

The patterns are kept in this office, and there are machines for cutting up the cloth. The section gives the units every assistance it can. The tendency is to do less and less regimentally.

In the management of the money allowed for the clothing and equipment of a regiment (or independent battalion) or brigade division, the commander is assisted by a regimental committee, consisting of a field officer, captain, and subaltern. Any articles that the committee may require are obtained through the clothing office, or purchased direct as suits it.

In war the clothing section continues to supply the units of army corps with clothing and equipment.

Arms and ammunition are in charge of combatant officers, assisted by regimental armourers.

It should be noted that there is no army corps ordnance store service. There is a central ordnance with various factories. Each army corps has various expense depôts under charge of the units, all mobilisation stores are drawn from them, and the army corps commander indents on the central store in order to fill up, as he expends them.

An infantry regiment, for example, has three classes of store rooms :—

1. Company (squadron, battery) where spare stores for the peace strength are kept.
2. Battalion (brigade division) for the gear of the men joining on mobilisation.
3. Regimental, for gear of war formations, new stores, and material.

IV. *Barracks.*

The Garnisons-Verwaltung section has two branches :—

1. One somewhat similar to the Barrack Section of the Army Service Corps.
2. The other to the Barrack Division of an Engineer command.

1. The garrison administration deals with the allotment and equipment of barracks, guard-rooms, clothing stores, drill sheds, parade grounds, etc., and their maintenance in good order. The troops of the garrison send all requisitions concerning barracks or barrack stores direct to it.

There are 245 such administrations in Germany, and an inspector for each barracks.

2. The Garnison Bauwesen, or Garrison Office of Works, undertakes the erection of all buildings not fortifications, and assists the administration section with advice. It draws up plans and asks for contracts. If the work is over £1,500, War Office approval has to be obtained. The actual work is done by civilian contractors, under the superintendence of the Works officials. The subordinate staff are recruited from non-commissioned officers of Engineers.

Money is allotted under three headings: major buildings, minor buildings, and repairs.

V. *Hospitals.*

At the head of each garrison hospital is a chief surgeon; he has complete control of the medical and administrative services of it. He is assisted by a hospital inspector, who is an official of the Intendantur.

The inspector and his subordinates are in charge of the food supply, the pay of the staff and patients, the storage of the effects of patients, all stores and furniture.

The invaliding and pensioning of soldiers is arranged by the section.

Numbers Employed in the Intendantur.

The Vth Army Corps has been selected at random as an example.

The number of officials with relative rank of officers (Class I.) has been taken from the actual names in the Prussian Army List, 1899. The number of officials not having the relative rank of officers (Class II.) has been taken from the names in Siekmann's "Taschen-Kalender für Beamte der Militär-Verwaltung." As regards Class III., the total of the *personnel* given in the Prussian Budget for 1900 have been divided by 17, the number of the army corps, so as to give an approximate idea of the number employed.

Summary (detail follows).

Section.	Officials.		Class III. Storemen, Tradesmen, Messengers, etc.
	Class I.	Class II.	
1. Finance	8	39	4
2. Supply	8	14	19 with soldier bakers.
3. Clothing	4	3	153
4. *a.* Staff	1	—	—
b. Garrison Administration...	15	20	63 and probationers, number unknown.
c. Building	5	8	— £450 allowed for technical assistance.
5. Hospitals	20[1]	11	17
	61[2]	95	256

[1] Medical Officers. [2] Includes Medical Officers.

Details of each Department.

I. Kassen. (Central Office and Finance Section.)

Class I.

Intendant of Corps (at headquarters) - -	1
,, Councillors ,, - - -	3
,, Assessors ,, - - -	2
,, of Divisions (at Division Headquarters)	2
	8

Class II.

Secretaries - - - - - - - -	28
,, uncovenanted service - - -	4
Registrars - - - - - - - -	3
,, uncovenanted service - - -	2
Clerks - - - - - - - - -	2
	39

(All at headquarters, except three or four with each division.)

Class III.

2 messengers, 1 servant, and 1 doorkeeper.

The paymasters are under this section.

The number of regimental paymasters is :—

Per infantry regiment - - - - -	2
,, cavalry ,, - - - - -	1
,, artillery ,, - - - - -	3
,, pioneer battalion - - - - -	1
,, train battalion - - - - - -	1

Total per army corps, 32, with 136 probationers as assistants (in Vth Army Corps).

II. Proviantamt. (Provisions and forage.)

Class I.

Directors - - - - - - - -	2
,, accountants (in various garrisons) -	6
	8

Class II.

Assistants - - - - - - - -	11
Probationers - - - - - - - -	3
	14

It appears that there are officials of this section only in garrisons where the mounted branches (cavalry, artillery, and train) are stationed.

Class III.

1 Engineer.
1 Assistant Engineer.
1 Miller.
4 Master Bakers.
9 Storekeepers.
3 Storemen.

As already noted, soldiers serving are employed as bakers.

III. Clothing Office.

Class I.

President (all at headquarters)	1
Staff officer „ „	1
Members „ „	2
	4

Class II.

Accountant	1
Accountant assistants	2
	3

Class III.

1 Machinist.
1 Master Packer.
1 Storekeeper.
2 Storemen.
1 Probationary Paymaster.

Tradesmen :—

11 Non-commissioned Officers, and
117 Men.

There are besides, 3,378 regimental tradesmen, or 198 per army corps.

IV. Barracks, Furniture, and Buildings.[1]

Intendantur building counsellor - - - 1

With two branches :—

a. Building.
b. Garrison administration.

Building.

Class I.

Building counsellor	2
Inspectors	3
	5

Class II.

Foremen of works	4
Draughtsmen	4
	8

Class III.

Uncertain number of probationers. £450 per annum allowed for assistance.

Class I.

Garrison Administration.

Directors	2
Inspectors	13
	15

[1] The Vth Army Corps is in the second of the three engineer districts ; the engineers actually in the district for the care of fortifications (not under Intendantur) are :—Posen, Officers 9, Foremen of works 9; Glogau, Officers 2, Foremen of works 2.

Class II.

Barrack Inspectors - - - - -	20

Class III.

Barrack warders - - - - - -	63

A uniform for probationers of this section has been sanctioned this year, but the numbers employed are not known.

V. Hospitals, Invaliding, and Pensions.

Class I.

Corps medical officers - - - - -	1
,, ,, assistant - - - - -	1
Divisional medical officers - - - -	2
Chiefs of hospital - - - - - -	16
	20

Class II.

Hospital head inspectors - - - - -	2
,, administrators - - - - -	2
,, inspectors - - - - - -	7
	11

Besides these, each

Infantry regiment has - - - -	3 doctors.
Cavalry ,, ,, - - -	2 ,,
Artillery ,, ,, - - - -	3 ,,
Pioneer battalion ,, - - - -	2 ,,
Train battalion ,, - - - -	1 ,,

So there are per army corps about 37 regimental doctors.

Class III.

2 machinists and 15 civilian servants.

The following table gives the various garrisons in the Vth Army Corps, and the number of the various Intendantur officials in each.

Garrison.	Section.	Officials. 1st rank.	Officials. 2nd rank.
Posen.			
Headquarters Army Corps ,, 10th Division ,, 19th Infantry Bde. ,, 20th ,, ,, ,, 10th Cavalry ,, ,, 10th Artillery ,, 6 Infantry battalions 5 Squadrons 6 Batteries 2 Fortress Artillery battalions 1 Train battalion	Finance (A.C.) ... ... Finance (Division) ... Supply ... ... Clothing ... ... Garrison Administration... Building ... ... Medical	6 1 1 4 2 4 3	32 3 6 3 14 4 5
		21	67

Table of Garrisons and Intendantur Officials—contd.

Garrison.	Section.	Officials. 1st rank.	Officials. 2nd rank
Lissa.	Supply	1	1
1 Battalion	Garrison Administration...	1	—
6 Batteries	Medical	1	—
Frauenstadt.			
1 Battalion	Medical	1	—
Rawitsch.			
2 Battalions	Garrison Administration...	1	—
	Medical	1	—
Krotoschin.			
3 Battalions	Garrison Administration...	1	1
	Medical	1	1
Ostrova.			
Headquarters 77th Infantry Bde.	Garrison Administration...	1	—
2 Battalions	Medical	1	1
1 Squadron			
Glogau.			
Headquarters 9th Division			
,, 17th Infantry Bde.			
,, 9th Cavalry ,,	Finance	1	4
,, 9th Artillery ,,	Supply	1	2
2 Battalions	Garrison Administration...	1	4
5 Batteries	Building	1	2
1 Fortress Artillery Battalion	Medical	1	2
1 Pioneer Battalion			
1 War School			
		5	14
Sprottau.	Supply	1	1
6 Batteries	Garrison Administration...	1	—
	Medical	1	—
Sagan.	Supply	1	—
2 Horse Batteries	Garrison Administration...	1	—
	Medical	1	—
Lüben.	Supply	1	2
5 Squadrons	Garrison Administration...	1	—
	Medical	1	—
Liegnitz.	Garrison Administration...	1	1
Headquarters 18th Brigade	Building	1	2
	Medical	1	1

Table of Garrisons and Intendantur Officials—contd.

Garrison.	Section.	Officials. 1st rank.	Officials. 2nd rank.
Jauer. 2 Battalions	Garrison Administration...	1	—
	Medical	1	—
Hirschberg. 1 Battalion	Medical	1	—
Lauban. 1 Battalion	Garrison Administration..	1	—
Gorlitz. 2 Battalions	Garrison Administration...	1	—
	Medical	1	—
Militsch. 4 Squadrons	Supply	1	1
	Medical	1	—
Zulichau. 5 Squadrons	Supply	1	1
	Garrison Administration...	1	—
	Medical	1	—

Army Administration Department at the War Office.

The division of the War Office, which deals with the technical business of the Intendanturs, is called the Army Administration Department (*Armee Verwaltungs-Departement*). It is presided over by a Major-General, with one A.D.C.

It has five sections. The number of the officials in each are given below. An independent medical section deals with medical administration.

Army Administration Department.

—	Army Officers.	Officials. Class I.	Officials. Class II.
Staff	2	—	—
Finance Section	—	4	13
Supply Section...	—	5	28
Clothing Section	3	1	9
Quarters Section	3	3	18
Building Section	—	6	5
Medical Section (not under Army Administration Department)	7	1	17

The Intendantur section of the Central Department, in which there are two officials Class I. and five Class II., deals with questions affecting the *personnel* of the Intendanturs.

NAVAL NOTES.

HOME.—The following are the principal appointments which have been made: Rear-Admiral—J. L. Hammet to be Second-in-Command of Reserve Squadron during the Manœuvres. Captains—A. C. Corry to "Camperdown"; W. G. White to "Northampton"; H. Warren to "Vindictive." For ships commissioned for Manœuvres:—Captains—S. H. Carden to "Andromache"; G. E. Patey to "Apollo"; J. Denison to "Ariadne"; R. S. Sparkes to "Blake"; P. Hoskyns, C.M.G., M.V.O., to "Blenheim"; C. H. Robertson, C.M.G., to "Brilliant"; F. C. Pelham to "Conqueror"; H. N. Dudding to "Dreadnought"; G. J. Fleet to "Edgar"; D. M'N. Riddel to "Edinburgh"; C. E. Kingsmill to "Gibraltar"; J. Casement to "Gladiator"; C. Burney to "Hawke"; C. J. Baker to "Hero"; A. C. A. Galloway to "Immortalité"; M. H. Smyth to "Mersey"; R. H. Stokes to "Naiad"; C. R. Keppel, C.B., D.S.O., to "Rainbow"; W. W. Hewett to "Retribution"; R. B. Farquhar to "Sirius"; Hon. A. E. Bethell to "Sultan"; H. Leah to "Superb"; C. H. Coke to "Talbot." Commanders—J. de C. Hamilton to "Hecla"; H. J. Laxton to "Perseus"; R. B. Colmore to "Phœbe"; R. H. Travers to "Pioneer"; E. C. Troubridge to "Prometheus."

The "Camperdown" commissioned on the 5th inst. as an additional coast-guard ship on the coast of Ireland; she is to be stationed at Rathmullen. The old battle-ship "Achilles" is to take the place of the "Hibernia" as receiving-ship at Malta. The first-class battle-ship "Goliath" left Plymouth on the 2nd ult. for China, convoying the torpedo-boat destroyers "Coquette," "Cygnet," "Conflict," and "Hornet" to the same station. The first-class cruiser "Edgar" arrived at Plymouth with relieved crews from China on the 1st ult., and paid off at Devonport on the 19th ult. The third-class cruiser "Pyramus" commissioned at Chatham on the 1st ult. for the Mediterranean, and sailed for her station on the 11th ult., where she takes the place of the "Polyphemus." The first-class cruiser "Powerful" and the second-class cruiser "Iphigenia," from China, paid off at Portsmouth on the 8th ult. H.M.S. "Melpomene" arrived at Portsmouth from the East Indies on the 14th ult. H.M.S. "Rattler" arrived at Plymouth on the 18th from China, and will pay off at Sheerness. H.M.S. "Revenge" paid off at Chatham on the 22nd ult. from the Mediterranean. H.M. gun-boats "Bramble" and "Britomart" commissioned at Devonport on the 28th ult. for the China station. H.M.S. "Narcissus," one of the belted cruisers, is to be attached to the "Excellent" for sea-going gunnery purposes. The following ships have been sent to reinforce the squadron in China:—From the Mediterranean, the second-class cruisers "Isis" and "Dido"; from Australia, the third-class cruisers "Wallaroo" and "Brisk," and first-class gun-boat "Ringdove"; from the Pacific, the second-class cruiser "Arethusa," and the third-class cruiser "Marathon" from the East Indies.

The Naval Manœuvres.—Rear-Admiral Hammet has hoisted his flag on board the "Sans Pareil" as second-in-command of the Reserve Squadron for the Manœuvres.

The following ships have been specially commissioned:—

Second-class battle-ship—"Edinburgh."

Third-class battle-ships—"Dreadnought," "Sultan," "Superb," "Hero," "Conqueror."

First-class cruisers—"Immortalité," "Blake," "Blenheim," "Edgar," "Hawke," "Ariadne," "Gibraltar."

Second-class cruisers—"Talbot," "Sirius," "Andromache," "Apollo," "Retribution," "Rainbow," "Naiad," "Brilliant," "Mersey."

Third-class cruisers—"Phœbe," "Perseus," "Pioneer," "Prometheus."

Torpedo-gunboats—"Jaseur," "Speedwell," with twenty-four torpedo-boats.

The following vessels will have their complements completed and will also take part in the Manœuvres.

Third-class cruisers—"Medea," "Medusa."

Torpedo-gunboats—"Antelope," "Skipjack," "Renard," "Spanker," "Sheldrake," "Leda," "Gleaner," "Alarm," "Circe," and "Sharpshooter."

Steam Trials.—The second-class cruiser, "Highflyer" having had defects in her machinery made good, has left for the East Indies, where she relieves the "Eclipse" as flag-ship, after a successful full-speed trial, which gave the following results:—Steam in boilers, 295 lbs.; at engines, 241 lbs.; vacuum, starboard 24·5 inches, port 25·1 inches; revolutions, starboard 180·4, port 178·9; I.H.P., starboard 5,180, port 5,005—total, 10,185; air pressure, ·22 inch; speed, 19 knots.

The new torpedo-boat-destroyer "Stag" has successfully concluded her three hours' full-speed trial, her average speed being 30·345 knots, while for the six runs on the measured mile the average speed was 30·515 knots. The highest speed attained when going with the tide was 32·727 knots. The official details are as under:—Draught of water, forward 5 feet 9¾ inches, aft 7 feet 1½ inches; steam pressure in boilers, 213 lbs.; vacuum in condensers, starboard 24·7, port 24·8; revolutions per minute, starboard 385, port 381·6; mean I.H.P., starboard 2,768, port 2,791—total 5,559.

The Turbine Destroyer "Cobra."—A few weeks ago details were published of the performance of the turbine-propelled destroyer "Cobra," which was built as an experimental vessel by Sir William Armstrong, Whitworth & Co. Doubts having been expressed as to the accuracy of the results then reported, the contractors, with the consent of the Admiralty, have repeated the trials, which took place off the mouth of the Tyne. Careful records were taken, especially of the mean speed for the three hours' run, with regard to which the doubts were more particularly expressed. The following were the mean results for the three hours run:—Steam pressure in boilers, 200 lbs.; revolutions per minute, 1,150; speed, 34·3 knots; coal consumed for the three hours, 43 tons. The maximum speed during the trial was 35·6 knots.

Speed Trials in the Mediterranean and the Belleville Boilers.—There have been so many adverse criticisms regarding the introduction of Belleville boilers into the Navy, that it is gratifying to hear of the excellent performance of the battle-ship "Ocean," at present attached to the Mediterranean Squadron, under the command of Vice-Admiral Sir John A. Fisher, K.C.B. On the 9th, 10th, and 11th inst., the Mediterranean Squadron carried out a steam trial of 788 miles at four-fifths power, from six miles east of Gibraltar to six miles north of Cape Figan, Sardinia. The "Ocean" proved by far the best steamer of the squadron, and although she has only recently commissioned, and her engine-room department are more or less new to the ship, she averaged during the whole of the trial a speed of 16·8 knots, which is very creditable. The "Ocean" consumed 520 tons of coal, and took 46 hours 54 minutes on the trial. The only ships that approached her were the cruisers "Isis" and "Dido," with an average speed of 16·7 knots and 16·25 knots respectively. The best battle-ship result after the "Ocean" was that of the "Renown," whose average speed was 16 knots, but the "Renown" always has been one of the most successful battle-ships in this respect.

Launch.—A single-screw, wood-sheathed steel sloop was launched from the works of Laird Bros., at Birkenhead, on Wednesday, the 6th ult. This latest addition to the Navy, which will be known as the "Rinaldo," is of 980 tons displacement and 1,400-H.P. The "Rinaldo" is a sister ship to the "Mutine," which was launched from the same yard about three months ago. The machinery and boilers for both ships have been constructed by Laird Brothers.

The Committee on Explosives.—The following gentlemen have been appointed to serve as a committee to inquire into the matter of arms and explosives, viz., Lord Rayleigh (chairman), Sir Andrew Noble, K.C.B., Mr. Haldane, M.P., Sir W. Roberts-Austen, Sir William Crookes, and Captain T. G. Tulloch, R.A., as secretary. The object of the Committee is to carry out trials with a view to ascertaining what are the best smokeless propellants for use in existing guns of all natures and in existing small arms, and to report as to whether any modification in the existing designs of guns is desirable with a view to developing to the full the powers of any propellant which may be proposed. In view of the appointment of the above Committee, the following extracts from a report issued by the Smokeless Powder and Ammunition Company may be of interest. This report embodies the results of a series of trials of cordite, which is a nitro-glycerine compound, in comparison with "rifleite," a pure cellulose powder. The trials were carried out under a programme of which full particulars are given in the report. This programme gives the conditions of the trials. They were varied between the third and fourth trials by the addition of further series from ovens at 100° F. These cartridges kept at 100° F. were fired under the same rules as laid down in the programme referred to. The trials began on 8th December, 1898, and finished on 15th June, 1899; except the additional tests "rifleite ·303" as now made under the new patented processes. These additional records were obtained later in 1899. Subjoined are extracts from the report:—

"The main object of the trials was to see whether 'rifleite ·303' cartridges would be deleteriously affected by storage under any climatic condition. And it may be recorded as early as this, that on this point the trials show very clearly that 'rifleite ·303' cartridges would be practically constant in ballistics under all climatic conditions. Cordite cartridges were shot alongside as another powder to fix any instrumental or personal variations. It was also intended to ascertain the merits of 'side' and 'base' systems of taking the pressures of rifle cartridges, and to fix on some rules for taking these pressures which it would be advisable to adopt. This was more especially desirable as there is no generally recognised method for taking the pressures of rifle cartridges. The tabulated results show that neither temperature nor heating materially affects the velocities of 'rifleite ·303' cartridges, although both decrease the pressures. On the other hand, they show that cordite cartridges give less pressures and velocities when heated and allowed to cool before shooting, and that if fired while hot both the pressures and the velocities are materially increased. The trials show indisputably how injudicious it is to rely on one test. The standard cartridges gave quite distinct results at each station, and even at different trials, the ballistics increasing or decreasing at one test and reverting back to the original at a later test. Moreover, on the same day, and when less than 15 minutes separated the shooting of two series, at one station rifleite cartridges gave in one series an average M.V. of 1,956 foot-seconds, and in another an average M.V. of 2,023 foot-seconds; at another station cordite cartridges gave in one series an average M.V. of 1,956 foot-seconds, and in another series an average M.V. of 2,020 foot-seconds. There can be no doubt one of the results in each instance was anomalous and the error undoubtedly instrumental. As to the final results of the trials, they show an exceptionally large increase of 'rifleite ·303' over and above the standard charge does not materially increase the pressures above those given by the standard charge, the pressure of the standard load

of 'rifleite ·303' being practically the same, or slightly less, than that of the cordite cartridges. Moreover, the earlier tests showed, as has been pointed out, that 'rifleite' cartridges are not affected by heat or storage in hot climates."- *Naval and Military Record* and *Times*.

AUSTRIA-HUNGARY.—*The Naval Estimates.*—The Ordinary Budget for the Navy for 1900 amounts to 25,556,050 kronen (£1,064,836), being an increase of 3,365,530 kronen (£140,230) over that for 1899, while the Extra-Ordinary Budget amounts to 13,910,450 kronen (£579,602), an increase of 2,418,450 kronen (£100,768) over 1899, making a total increase in both budgets of 5,783,980 kronen (£240,998).

The principal items of the Ordinary Budget are as follows: -

	Kronen.	£
Pay of officers, officials, etc.	4,138,360	= (172,432)
„ Petty officers and seamen with clothing allowances	2,609,070	(108,711)
„ Land service	1,725,600	(71,900)
„ Sea service	3.478,970	(144,957)
Establishments :—		
Hydrographic office, Naval Academy, Schools, etc.	464.290	(19.345)
Maintenance of the Fleet :—		
Dockyards, etc.	6,347,770	(264,490)
Ship-Construction and Machinery :—		
Fifth and last Vote out of a total Vote of 3,277,400 kronen (£136,559) for torpedo-cruiser "Zenta" (A)... ...	295,420	(12,309)
Fourth Vote out of a total Vote of 3,200,000 kronen (£133,333) for torpedo-cruiser "Aspern" (B) ...	695,240	(28,968)
Second Vote out of an approximate total Vote of 3,200,000 kronen (£133,333) for torpedo-cruiser C, type "Zenta," 2,350 tons, Ersatz "Fasana" ...	1,716,190	(71,508)
First Vote of an approximate total Vote of 9,900,000 kronen (£412,500) for ram-cruiser E of about 7,000 tons, Ersatz "Radetzky"	619,050	(25,794)
First Vote out of a total Vote of 250,000 kronen (£10,417) for five submarine-mine tenders of about 200 tons ...	130,000	(5,417)
Ordnance, etc.	759,050	(31,627)
Miscellaneous expenses	3,007,060	(125,294)
Total	25,986,070	(1,082,752)
Certain deduction	430,000	(17,917)
Total demanded	25,556,070	(1,064,835)

The following are the principal items of the Extra-Ordinary Budget :—

	Kronen.	£
Certain expenses in connection with Naval Academy, Naval Schools, chronometers, ships' libraries, etc., etc.	25,320	= (1,055)
Maintenance of Fleet : For New Constructions :—		
Sixth and last Vote out of a total of 2,300,000 kronen (£95,833) for six sea-going torpedo-boats	140,000	(5,833)
Fifth Vote out of a total of 8,200,000 kronen (£341,666) for ram-cruiser "Kaiser Karl VI." (D) of 6,250 tons	860,950	(35,873)
Third Vote out of a total Vote of 11,000,000 kronen (£458,333) for coast-defence battle-ship I. of 8,340 tons	3,563,810	(148,492)
Second Vote out of a total Vote of 11,000,000 kronen (£458,333) for coast-defence battle-ship II. of 8,340 tons	3,571,420	(148,809)
First Vote out of a total Vote of 11,000,000 kronen (£458,333) for coast-defence battle-ship III. of 8,340 tons	829,520	(34,563)
Ordnance : Guns, Mountings, Torpedoes, Ammunition, etc. :—		
Third Vote for armament of ram-cruiser "Karl VI." (D)	979,230	(40,801)
Second and last Vote for armament of torpedo-cruiser "Aspern"	362,860	(15,119)
First Vote for armament of torpedo-cruiser C	227,430	(9,476)
First Vote for armament of battle-ship I.	1,394,290	(58,095)
First Vote for armament of battle-ship II.	706,670	(29,445)
Third Vote for armament of torpedo-cruiser "Zenta"	100,000	(4,166)
First Vote for armament of torpedo-cruiser C	100,000	(4,166)
Submarine mines	131,430	(5,476)
Torpedoes, etc.	285,710	(11,904)
Workshops in dockyards and other buildings	631,800	(26,325)
Total	13,910,440	(£579,598)

Personnel.—According to the Estimates, there are on the Active List :— 1 admiral, 2 vice-admirals, 6 rear-admirals, 17 captains, 64 commanders, 199 lieutenants, 191 sub-lieutenants, and 180 cadets. On Supernumerary List for shore

duty only :—1 rear-admiral, 2 captains, 10 commanders, 48 lieutenants, and 7 sub-lieutenants. There are 9 chaplains, 62 doctors, and 178 paymasters; while the seaman *personnel* consists of 7,410 warrant officers, petty officers, and men, with 420 boys.

Manœuvre Squadron.—The squadron is under the command of Rear-Admiral Graf von Montecuccoli, who is flying his flag on board the first-class armoured cruiser "Kaiser Karl VI.," and is made up of three divisions as follows:—

First Division.

Armoured cruisers—"Kaiser Karl VI." (flag-ship of Commander-in-Chief), "Kaiserin und Königin Maria Theresia," "Kaiserin Elizabeth."

Second Division.

Torpedo cruisers—"Tiger" (senior officer's ship), "Panther," "Leopard," "Satellit."

Third Division.

Torpedo cruisers—"Aspern," "Planet," "Blitz."
Torpedo-avisos—"Natter," "Python," "Kigzo."
Torpilleurs-de-haute-mer—"Weihe," "Würger," "Geier," "Ibis," "Kranich," "Condor," "Sperber," "Bussard," "Flamingo," and boats Nos. 14, 19, 24, 25, 26, and 27.

The following ships are on foreign service—Training frigate "Donau," and torpedo-cruiser "Zenta."
The "Maria Theresia" has now been ordered to China.

—*Mittheilungen aus dem Gebiete des Seewesens.*

FRANCE.—The following are the principal promotions and appointments which have been made:—Capitaines de Vaisseau—H. de Barbeyrac St. Maurice to be Rear-Admiral; J. Baëhme to "Amiral Charner"; A. J. Fouet to "Terrible." Capitaines de Frégate—J. C. L. Gaschard to Capitaine de Vaisseau; A. V. Adam to "Friant"; V. M. Morazzani to "Nive."—*Le Journal Officiel de la République Française.*

General.—The old transport "Tonkin," which is being fitted out as the new sea-going training-ship for cadets, is to be renamed the "Duguay-Trouin"; the last ship of the name, a second-class cruiser, has lately been struck off the effective list of the Navy; the new "Duguay-Trouin" is to be a barque-rigged, and she is to start next October on her first cruise, which will be one round the world, instead of merely cruising in the Atlantic, as has been the case of late years with the "Iphigénie." The work of replacing the cylindrical boilers of the second-class battle-ship "Dévastation" at Brest is proceeding satisfactorily; the new Belleville boilers, with which she is being supplied, will effect a lightening of the ship to the extent of 200 tons. The coast-defence battle-ship "Tempête" is to proceed to Bizerta, where she will relieve the armoured gun-boat "Achéron," which returns to Toulon to receive new boilers and undergo other repairs, the wood fittings, among other things, being removed. At Toulon also the work of replacing the cylindrical boilers of the first-class battle-ship "Marceau" with water-tube boilers of the Niclausse type has been taken in hand.

Reinforcements for China.—The first-class cruiser "Guichen" has been detached from the Northern Squadron to China, with orders to proceed at and maintain as high a rate of speed as possible; the first-class armoured cruiser "Amiral Charner" and the second-class cruiser "Friant" have also left for the same destination, while the second-class cruisers "Chasseloup-Laubat" and "Bugeaud," with the new gun-boat "Décidée," are also under orders to proceed East. It is stated that Vice-Admiral de la Bonninière de Beaumont is to take

command of the squadron in Chinese waters, in view of its largely increased strength, and that the English, Russian, and German fleets are all commanded by vice-admirals.

Steam Trials.—The first-class battle-ship "Hoche" has made a successful preliminary trial of her water-tube boilers, which are of the "Belleville" type. She is the first of the older battle-ships to have water-tube boilers substituted for her cylindrical ones.

The new destroyer "Fauconneau" has made several successful trials, maintaining a mean speed of 27·5 knots. Torpedo-boat 229 has also successfully concluded her official trials, the mean speed maintained was 24·8 knots. The new destroyer "Yatagan" has arrived at Lorient from Nantes, where she was built, and will shortly undergo her official trials.

The new first-class gun-boat "Zélée" has concluded her trials; at one-third power the engines developed 335-I.H.P., with a coal consumption per H.P. per hour of 574 grammes; during a twenty-four hours' run, the engines developing 550-I.H.P., the coal consumption per H.P. per hour was 727 grammes. During the six hours' full-speed trial the engines developed 953-I.H.P., giving a speed of 13·5 knots with a coal consumption of 721 grammes per H.P. per hour. Her boilers are of the Niclausse type.

Her sister ship, the "Décidée," has also successfully completed her trials, she also has Niclausse boilers, but the coal consumption has somewhat varied. At one-third power the consumption was 687 grammes per H.P. per hour; at 500-I.H.P., the consumption was 767 grammes per H.P. per hour, and at the full-speed trial it rose to 818 grammes per H.P. per hour, the speed of the ship being 13 knots.

The Naval Manœuvres.—Vice-Admiral Gervais hoisted his flag on board the first-class battle-ship "Bouvet," at Toulon, on the 21st ult., in command of the combined Mediterranean, Reserve, and Northern Squadrons. The rank of full admiral does not exist in the French Navy, but the regulations provide for the issuing of a commission of admiral to a vice-admiral commanding a combined fleet, and it is probable that Vice-Admiral Gervais will hoist his flag at the main on board the "Bouvet," his flag-ship. The last time combined manœuvres were held was in 1890, when Admiral Duperré took the supreme command, proceeding with the Mediterranean fleet to make a junction with the Northern Squadron off Brest. Vice-Admiral Gervais was in the 1890 manœuvres a rear admiral, and in command of the Second Division of the 1st Squadron.

The combined fleet will consist of the following ships:—

MEDITERRANEAN SQUADRON.

First-class battle-ships—"Bouvet" (flag-ship of Commander-in-Chief), "Brennus" (flag-ship of Vice-Admiral Fournier, commanding Mediterranean Squadron), "Charles-Martel" (flag-ship of Rear-Admiral Roustan), "Charlemagne," "Gaulois," "Jauréguiberry."

First-class armoured cruisers—"Pothuau" (flag-ship of Rear-Admiral Maréchal), "Chanzy," "Latouche-Tréville."

Second-class cruisers—"Cassard," "Du Chayla," "D'Assas."

Third-class cruisers—"Linois," "Lavoisier," "Galilée."

Destroyers—"Dunois," "Hallebarde."

Squadron torpedo-boats—"Cyclone," "Forban," "Flibustier," "Chevalier."

Torpedo depôt-cruiser—"Foudre."

The Reserve Squadron is composed of the following ships:—

Coast-defence battle-ships—"Bouvines" (flag-ship of Rear-Admiral Mallarmé), "Valmy," "Amiral-Tréhouart," "Jemmapes."

THE NORTHERN SQUADRON.

First-class battle-ships—"Masséna" (flag-ship of Vice-Admiral Ménard commanding), "Carnot," "Amiral-Baudin," "Formidable" (flag-ship of Rear-Admiral Touchard), "Amiral-Duperré."
Second-class battle-ship—"Redoutable."
First-class armoured cruisers—"Dupuy de Lôme," "Bruix."
Third-class cruiser—"D'Estrées."
Destroyers—"Fleurus," "Cassini," "La Hire," "Durandal."
Squadron torpedo-boats—"Aquilon," "Mangini."

The first-class torpedo-boats Nos. 180, 185, 186, 201, 203, 204, and 191 of the *Défense-Mobile* of Corsica have been mobilised under Capitaine de Frégate Favereau; they will take part in the manœuvres and accompany the fleet to the North. No. 191 having to change her boilers, will afterwards be relieved by No. 233.

The following is a brief programme of the movements of the fleets during the manœuvres:—

21st June, at daylight, departure of the torpedo-depôt-ship "Foudre" and Coast-Defence Squadron, under Rear-Admiral Mallarmé, which are due to arrive at Oran on 24th June. At noon on 21st, the "Charles-Martel" and the cruisers and destroyers (namely 1 armoured cruiser, 2 second-class cruisers, and 2 destroyers), placed under the command of Rear-Admiral Roustan, were to leave Toulon, and were due to arrive at Oran on 26th June. Between the evening of 21st and morning of 23rd June, the remainder of the Mediterranean fleet under Admiral Gervais left Toulon and was due at Oran on 26th.

On 27th June, the whole fleet was to leave Oran and effect its junction with the Northern Squadron in the Atlantic Ocean on 2nd July.

6th July, the combined fleets arrive at Quiberon.

8th or 9th July, arrival at Brest.

11th or 12th July, arrival at Cherbourg.

19th July, Grand Review of combined squadrons at Cherbourg.

All ships are to be ready to illuminate on arrival at Cherbourg. Admiral Gervais has ordered the prefet maritime of Cherbourg to mobilise the torpedo-boats of the *Défense-Mobile* during the manœuvres. They will defend Cherbourg, which will be attacked by the Northern Squadron. The Mediterranean Squadron will defend the entrance of the Channel.

Launches.—The first-class armoured cruiser "Gloire" was launched at Lorient on the 27th ult. Her dimensions are as follows:—Length, 452 feet 9 inches; beam, 65 feet 4 inches; displacement 10,000 tons, with a draught of 24 feet 6 inches. The engines, driving three screws, are to develop 20,000-I.H.P., giving a speed of 21 knots, her coal supply of 1,590 tons giving a radius of action of 10,400 miles at 10 knots, and 1,940 knots at full speed. Protection is afforded by a complete water-line belt of 5·9-inch steel, with an upper belt and bulkheads of 3-inch steel. 6-inch armour on the main turrets, and 4-inch on the casemates and secondary turrets. A 2-inch armoured deck, with a 1·4-inch splinter deck. Her armament comprises two 194-millimetre (7·6-inch) in turrets, one forward and one aft; eight 164·7-millimetre (6·4 inch), two in casemates with recessed ports on main deck aft, two forward, and four in turrets on upper deck; six 100-millimetre (3·9-inch), eighteen 47-millimetre (1·8-inch), and six 37-millimetre (1·4-inch) guns all Q.F. except the two 7·6-inch, and she has four torpedo-discharges, two of which are submerged. Her cost is 22,561,519 francs (£902,460). A sister ship, the "Marseillaise," constructed at Brest, is to be launched on 14th July. Her weight at launching will be about 3,000 tons, and she has been building only six months.

The torpedo-destroyer "Espingole" was launched at Havre on the 28th June. She is a sister ship to the "Hallebarde."

Orders have been issued to Cherbourg and Brest to lay down and commence the two first-class cruisers "Jules Ferry" and "Léon Gambetta." These two vessels are sisters and identical in all respects. They will have a displacement of 12,416 tons, their length will be 145 metres (475 feet) and beam 21·70 metres (69 feet), 24,000-H.P., estimated speed 21 knots. They will carry 1,950 tons of coal giving a radius of action at 10 knots of 10,000 miles and at full speed of 1,325 miles. Their armament will comprise, four 194-millimetre (7·6-inch), sixteen 164-millimetre (6·4-inch), twenty 47-millimetre (1·8-inch), and four 37-millimetre (1·4-inch) guns, and they will have five torpedo-discharges. The complement will be 23 officers and 687 men, and the cost of each amounts to 28,982,500 francs (£1,159,300). The "Ferry" is to be completed at Cherbourg early in 1905, and the "Gambetta" at Brest by the middle of 1904.

UNITED STATES.—*Final Trial of New Battle-ship "Kearsarge."*—Board of Inspection and Survey, 7th April, 1900.

SIR,—1. In obedience to the Department's order of 21st March, 1900, the Board has the honour to submit the following report on the final trial of the United States' ship "Kearsarge":—

Ship's draught in getting under way was:—Forward, 23 feet 2 inches; aft, 24 feet; mean, 23 feet 7 inches.

4. The weather was clear and pleasant in getting under way, and during the entire day there was a haze around the horizon, with light to gentle breezes from north to west, shifting to south and west during the afternoon. The sea was smooth. During the second day (4th April, 1900) the weather was overcast and cloudy, with light air generally from south to west until 1.30 p.m., when the wind shifted to north in fresh squall with rain. Fresh to strong breezes from north the remainder of the day with a moderate sea. The 5th April began cloudy, but cleared towards 2 a.m. The wind remained strong, blowing in heavy squalls about daylight. Sea moderate.

5. At 1 p.m. on 3rd April the two-hour full-power speed trial with natural draught was begun, with fires under all boilers, and with one representative of the contractors in the engine-room. The coal used was Pocahontas of fair quality, containing a large proportion of slack. The speed made was 14·99 knots per hour. The machinery, both main and auxiliary, worked very satisfactorily, with the exception of a heavy steam leak in starboard H.P. piston rod stuffing box. The boilers steamed freely.

At 3 p.m. the full-speed trial ended. The following is the *data* for the two-hours' full-power trial:—Average revolutions, starboard 98·7, port 26·9. Vacuum, starboard 26 inches, port 25·5 inches. Average steam pressure, 154 lbs. Coal per hour, 18,480 lbs. I.H.P., 8,483·25. Main and auxiliary engines, pounds of coal per H.P., 2·18. Speed by patent log, 1 to 2 p.m., 14·18 knots. Speed by patent log to 3 p.m., 15·80 knots. Average speed, 14·99.

During the afternoon of 3rd April the four guns in the forward turret were fired simultaneously at 4,000 yards range, and three of the projectiles apparently fell in the same spot; one fell about 300 yards beyond, but in line. The four guns from the after turret were also fired simultaneously, and in this case three projectiles apparently fell in the same spot; one 8-inch projectile fell to the right. During this test the blast from the 8-inch guns in the superposed turret did not inconvenience the people in the 13-inch turret. Careful observation in the forward turret structure showed the following horizontal deflection of upper portion of turret support, the measurements being taken at level of turret roller-path and immediately in rear of guns, the fixed point of reference being on the armoured barbette.

Deflection due to firing simultaneously two 13-inch guns and two 8-inch guns, 7·16 inch. Ditto for one 13-inch gun, 5·32. Rotation of turrets under this con-

dition, measurement being taken at roller path, 9 inches. Deflection for one 8-inch gun, 1·16 inches. Rotation of turrets under this condition very slight, but approximately 1·2 inch.

The recoil of the forward turret, due to the firing all four guns simultaneously, caused the socket of turret securing-bolt to slightly foul the inner face of barbette, the armour at this point being uneven and projecting inward more than a quarter of an inch further than at any other point. As the turret support regained, completely and immediately, its normal form, the damage resulting from this contact was confined to the supporting socket; and such casualties in the future can be eliminated by removing an inch layer from the outer surface of the socket. It may be remarked here that the wedges and turn buckles on main deck are amply sufficient to secure the turret, and that the principal use of the bolt in turret structure is for centring turret temporarily in drilling.

Reconstruction of the Second-class Cruiser "Atlanta."—An official report of a dock trial of the U.S. "Atlanta," which has been fitted with new engines, and has undergone other extensive repairs and alterations at the New York Navy Yard, states that the engines being run at varying speeds, it was found that, with natural draught, it was impossible to maintain more than about 45 revolutions under forced draught. It was not possible to maintain a higher speed than 55 to 60 revolutions, owing to the inability to maintain the steam pressure. Starting in with steam pressure of 160 lbs., and wide throttle giving about 75 revolutions of engine, the pressure steadily decreased. This was largely due to the inexperience of the firemen employed. There was no priming or carrying over of water, and no difficulty in maintaining the water at proper level. The forced-draught blowers worked well. With the exceptions hereafter noted, the engines worked smoothly and well at the highest speeds made. At the highest speeds the telescopic oiling gear of the crank pins vibrated excessively, and one of the I.P. telescopes broke off. It would seem desirable that additional oiling gear of wiper pattern should be fitted for the crank pins.

The work of reconstructing the "Atlanta" has been done under the direction of Naval Constructor Bowles. The old horizontal, compound engines have been changed to triple-expansion by the addition of a high-pressure cylinder. At the same time the eight old single-ended Scotch boilers have been removed and replaced by two single-ended Scotch boilers and four Wilcox and Babcock water-tube boilers, the Scotch boilers carrying 180 lbs. of steam, and the Wilcox and Babcock 250 lbs. This change has not only greatly increased the boiler capacity, but it has reduced the bulk of the installation sufficiently to allow the construction of an athwartship coal bunker, which will increase the total coal capacity of the vessel by 80 tons, or about 17 per cent. The ship's main battery has been entirely renovated. All of the guns, including the two 8-inch bow and stern weapons, are of the rapid-fire type, fully up to date.

The old wooden bulkheads have been removed and the panelling stripped from the ceiling and from the outboard turtleback, their place being taken by corrugated metal for the bulkheads, a coating of cork paint for the ceiling, and a covering of asbestos on the outboard walls. The wooden furniture is replaced by furniture of metal.

Not the least interesting and important improvement is the new system of water-tight, electrically operated doors, which have been designed by Naval Constructor Bowles, the "Atlanta" being the first vessel of the Navy to be fitted with them. In case of collision or other emergency every water-tight door on the vessel can be closed from the bridge. When the doors are to be operated a small signal lamp at the bridge, or other selected station, lights up during the movement and goes out as soon as the door is closed. If any of the crew should be shut in a water-tight compartment, or should it be necessary to pass from one compartment to another after the doors have been closed from the central station, all that it is necessary to do is to turn a spring lever at the particular door, when it

will open, the lever returning to the central position and closing the door automatically when the person has passed through. Other improvements include metal rifle racks, lockers and ladders, wire screens in place of wooden fixtures of this description, and folding metal berths in the officers' quarters.

Army Rifle for the Navy.—The initial step toward the introduction of a uniform calibre of small arms has been taken by the Navy, and hereafter, gradually, but continuously, the Navy will be supplied with the Army gun. It has been repeatedly stated in the *Journal* that the adoption of a uniform calibre had been postponed until consideration by the Army Ordnance officers of the rimless cartridge question had been considered and disposed of, and it was asserted that until this was done the Navy would continue to purchase its present 23·2 calibre rifles for the Service. The Army authorities, however, have decided to continue the use of the present cartridge and the present clip. It is said, aside from the fact that there were doubts of the practicability of the rimless cartridge, it was not deemed advisable just at present to make any further change in the mechanism of the gun. There have been so many alterations and changes that there is little left of the original Krag-Jorgensen, and the weapon is now known to the Service as the United States small arm. In its report one year ago, the board composed of Army and Navy officers set forth their reasons for the necessity of but one calibre of small arm for the two Services. The Navy has never admitted that the Army piece is the equal of the smaller calibre, higher velocity obtaining qualities and flatter trajectory of the Navy gun, but agrees that as the Army required ten guns to the Navy's one, the Army piece should be accepted.

Admiral O'Neil authorises the statement that already 1,000 Krag-Jorgensen rifles have been purchased by his bureau of the Army for the Navy and several additional thousands will be bought as they are required for service. It is not intended to retire the Navy gun in large numbers, but to introduce the Army piece as new ships are commissioned and fitted with later ordnance. The guns lately purchased are for the "Kearsarge" and her class, and as the "Illinois," "Alabama," "Wisconsin," and the "Maine" class come along they will also be equipped with the Army gun. In fact, when every one of the battle-ships, cruisers, monitors, and all other types of war-vessels building are put in service their ordnance outfit will comprise in part the Krag-Jorgensen. Further than supplying the Navy in this manner, it is not believed for the present that those ships having the Navy small arm on board will have them withdrawn for the Army piece. There is a general feeling that in time, perhaps it may be two or three years, a board will be appointed consisting of Army and Navy ordnance experts, for the purpose of considering some new type of small arm for both Services. This question is in the air, and has at least been discussed by the highest ordnance officials. Contingencies may arise requiring some other type of gun more desirable. The Navy will never be satisfied with the Army gun or rest content until an entirely new piece has been agreed upon by a joint board.—*Army and Navy Journal.*

State of Advancement of New Ships on 1st May.—Battle-ships—"Kearsarge," 99 per cent.; "Kentucky," 99; "Illinois," 78; "Alabama," 95; "Wisconsin," 91; "Maine," 25; "Missouri," 2; "Ohio," 18. Sheathed protected cruisers—"Albany," 99; "Denver," 0; "Des Moines," 0; "Chattanooga, 2; "Galveston," 0; "Tacoma," 0; "Cleveland," 0. Monitors—"Arkansas," 28; "Connecticut," 49; "Florida," 33; "Wyoming," 45. Torpedo-boat destroyers—"Bainbridge," 56; "Barry," 56; "Chauncey," 56; "Dale," 72; "Decatur," 71; "Hopkins," 53; "Hull," 53; "Lawrence," 90; "Macdonough," 89; "Paul Jones," 72; "Perry," 72; "Preble," 72; "Stewart," 24; "Truxtun," 19; "Whipple," 19; "Worden," 19. Torpedo-boats — "Stringham," 98; "Goldsborough," 99; "Bailey," 87; "Bagley," 43; "Barney," 55; "Biddle," 6; Blakely," 83; "De Long," 83; "Nicholson," 53; "O'Brien," 53; "Shubrick," 85; "Stockton," 89; "Thornton," 81; "Tingey," 58; "Wilkes," 43. Submarine torpedo-boat—"Plunger," 85.

MILITARY NOTES.

PRINCIPAL APPOINTMENTS AND PROMOTIONS FOR JUNE, 1900.

Lieut.-Colonel J. E. Lindley, from h.p. to be a D.A.Q.M.G. at Head Quarters. Colonel R. S. R. Fetherstonhaugh to be a Major-General on the Staff to command a Brigade, South African Field Force, with the local rank of Major-General whilst so employed. Lieut.-Colonel and Brevet Colonel F. F. Johnson, A.S.C., to be an A.A.G., South African Field Force, as Assistant to the Director of Supplies. Brevet Colonel W. L. Davidson, from Lieut.-Colonel, R.A., to be a Colonel on the Staff for R.A. in South Africa, and to have the substantive rank of Colonel in the Army. Lieut -Colonel L. W. Parsons, from R.A., to be a Colonel on the Staff for R.A. in South Africa, and to have the substantive rank of Colonel in the Army. Lieut.-Colonel F. J. W. Eustace, from R.A. to be an A.A.G. in South Africa, and to have the substantive rank of Colonel in the Army. Lieut.-Colonel J. R. Hobday, I.S.C., Deputy Surveyor-General of India, is granted the substantive rank of Colonel in the Army. Lieut.-Colonel H. de la M. Hervey, I.S.C., is granted the substantive rank of Colonel in the Army on appointment to command the Kohat-Kurrum Force. Major-General G. Barton, C.B., to be Colonel of the Royal Fusiliers (City of London Regiment). Brevet Colonel H. Kilgour, from Lieut.-Colonel h.p. to be Colonel to command the 35th Regimental District (the Royal Sussex Regiment). Lieut.-Colonel H. M. Mason, I.S.C., to be Colonel. Major-General H. J. T. Hildyard, C.B., from Major-General on the Staff, commanding 2nd Brigade, to be a Lieut.-General on the Staff to command the 5th Division in South Africa, and to have the local rank of Lieut.-General whilst so employed. Colonel (local Major-General) I. S. M. Hamilton, C.B., D.S.O., from Major-General on the Staff commanding a Brigade, to be a Lieut.-General on the Staff to command a Division, South African Field Force, and to have the local rank of Lieut.-General whilst so employed. Brevet Colonel A. W. Anstruther-Duncan, from Lieut.-Colonel h.p. R.A. to be a Colonel on the Staff for R.A., and to have the substantive rank of Colonel in the Army. Lieut.-Colonel G. E. Money, I.S C., an A.A.G. in India, is granted the substantive rank of Colonel in the Army. Colonel R. E. Allen, from an A.A.G., to be a Major-General on the Staff to command a Brigade, South African Field Force, and to have the local rank of Major-General whilst so employed. Colonel C. G., Earl of Erroll, and temporary Colonel C. C. W., Lord Chesham, to be Brigadier-Generals on the Staff to command Yeomanry Brigades, and to have the temporary rank of Brigadier-Generals whilst so employed. Brevet Colonel J. C. Barker to be a Colonel on the Staff for R.E. Colonel H. S. G. Miles, M.V.O., from an A.A.G. to be a D.A.G. Colonel F. W. Benson to be an A.A.G. Colonel A. E. W. Goldsmid, Commandant at Naauwpoort, to be an A.A.G. for Transport. Lieut.-Colonel H. G. Mainwaring, the South Wales Borderers, to be Colonel. Colonel (local Major-General) G. A. French, C.M.G., Commandant Colonial Forces, New South Wales, to be Major-General. Major-General G. T. Pretyman, C.B., R.A., to be a Major-General on the Staff, South African Field Force, and to be Military Governor of Bloemfontein. Colonel J. F. Hilton, from 23rd Regimental District, to command the troops in Barbadoes, and to have the temporary rank of Major-General whilst so employed. Colonel T. J. C. Herbert, C.B., C.M.G., to be an A.A.G., South African Field Force. Colonel J. H. H. S. D. Hogarth to be Colonel to command the 17th Regimental District (the Leicestershire Regiment). Major and Brevet Colonel B. M. Hamilton, the East Yorkshire Regiment, from an A.A.G.

to be a Major-General on the Staff, to command a Brigade, South African Field Force, and to have the local rank of Major-General whilst so employed. Lieut.-Colonel G. D. Stawell, A.A.G., India, to be Colonel.

INDIA.—The following Circular Memorandum has just been issued by the Adjutant-General in India to lieut.-generals in the four commands:—

The Commander-in-Chief having had under consideration the question of allowing a certain number of Native Infantry regiments to execute a special, or more advanced, course of musketry, the Adjutant-General is directed to circulate the following instructions with a request that the course may be fired by three or four selected regiments in each command.

In selecting the regiments lieut.-generals commanding must take into consideration that it is essential that suitable ground is available, and that the officers of the regiments selected are capable of carrying out the course in a thoroughly practical and instructive manner. No regiment is to be selected which has just been or is shortly to be re-armed with the L.M. rifle, as it is important that a regiment should execute a steady course of range practice the first year it is re-armed, so as to become thoroughly acquainted with the weapon under favourable conditions.

Course.—Marksmanship is the basis of all higher instruction in musketry, and deliberate individual firing at a fixed target is the only way the soldier can keep up confidence in himself and his rifle, and renew the instruction he received as a recruit of the way to overcome difficulties of wind, light, etc., and the peculiarities of his rifle, and his own shortcomings.

For this reason each soldier should do a short course of target practice. Twenty-five rounds are probably enough for most men, and the following distances, etc., are considered suitable:—

Distance.	Target.	Rounds.	Position.
Yards.			
200	3rd class	5	Standing.
500	2nd ,,	5	Kneeling.
600	2nd ,,	5	Any military.
700	1st ,,	5	
800	1st ,,	5	

The Commander-in-Chief desires that commanding officers be given a free hand in this course, and that they be allowed to authorise double company commanders to exempt noted good shots from firing this preliminary individual table—or to vary it, allowing established marksmen, for instance, to fire more rounds at longer ranges if desired, or practise at 900 and 1,000 yards. Although a man who has once become a marksman seldom deteriorates, it is considered that he should certainly fire a short course to keep himself up to the mark, and most marksmen, if given the option, would probably prefer to fire it to being excused.

Any soldier who cannot make 50 per cent. of points in the individual course is to be kept back for further practice on the principle that until he can make fairly good practice at a fixed target, at known distances, under easy conditions, it would be useless to allow him to waste ammunition at the practical course.

A soldier may be made to go through the whole of the individual course again—more than once if necessary—or fire again, as often as considered necessary, at distances where he failed and showed he required more practice.

When a man has, by repeating the individual course, or such parts of it as are considered necessary, made good enough practice to satisfy his double company

commander that he is fit to proceed to the practical course, he should be allowed to join in practices for which he has ammunition left.

Classification.—It is not considered advisable to abolish classification, and at the same time there is some difficulty in arriving at a satisfactory scheme. The course is to be as elastic as possible, and no considerations of what would look well in a return are to be thought of. There is no reason why a soldier who has failed to become a marksman or first-class shot the first time he fires the course should not on repetition of it, or of a part of it, make himself a marksman. At the same time there is no reason why a man who has failed to become a marksman, but who is good enough to proceed to the practical course, should be kept back at individual practice in order to make him into a marksman. The following classification will be tried for this year: –

a. Marksmen of last year who are especially exempted from the individual course this year will again be classified as marksmen.

b. Those who make 68 per cent. of points in the aggregate of the rounds fired in the individual course will be classified as marksmen.

c. Those who make 55 per cent. as first-class shots.

d. 40 per cent. second-class.

e. Below 40 per cent. third-class.

The percentage will be worked out on all the rounds fired. For instance, a man only makes 39 the first time he fires. He goes through the whole course again, and in the second course makes 65. In his 50 rounds he has made 104 out of a possible 202, or 52 per cent., and becomes a second-class shot. Another man makes 48 the first time. As he fired badly at 700 and 800 yards he is made to repeat these practices, and makes 18 and 17. In his 35 rounds he has made 83 out of a possible 140, or 59 per cent., and becomes a first-class shot.

Figure of Merit.—No figure of merit will be published and no comparison made between regiments. The percentages made in the various practices and individual firing will be shown in the report for the Commander-in-Chief's information, but in reviewing the reports he will take into consideration the way the course was executed, the practices selected, ground, etc., more than the figures arrived at.

Prizes.—10 annas a man will be drawn for all soldiers who complete the individual course, and the scheme for the distribution of the prize money will be drawn up by the commanding officer and submitted for the approval of the general officer commanding. Commanding officers should be allowed to allot this money as they like and are under no obligation to give any fixed amount to individual firing, etc.

Practical Course.—Each soldier is allowed 140 rounds a man for his annual course. After 25 rounds have been expended by each man in the preliminary individual course, and as much more as indifferent shots have to fire to make them fit to proceed to the practical course, the commanding officer will arrange for the more advanced practices. It is not necessary that each company should do the same, but if preferred each double company commander may invent different practices for each company. It is well known that many regiments which are very keen to do practical work may not have officers who are good at drawing up schemes, and therefore the following practices are quoted as suggestions to assist officers. It must, however, be understood that they are merely given as a guide and that commanding officers are in no way bound to follow them, as no doubt many other excellent practical ideas can be thought of.

Practical Individual.—A good deal of our fighting is against men who only show their heads when firing from behind a rock or expose themselves dodging about from cover to cover and therefore individual practice is required at moving and vanishing objects. Useful effect might be produced on an enemy's scouts or on officers reconnoitring one's position by skilled marksmen firing individually on such parties at long ranges. (Practices marked * can as a rule be fired on any ordinary range.)

*a. Seven (or more or less) iron targets, the size of a man's head, painted as a face, to fall when hit. To be fired at by one man of each section at a time, each man having seven targets. Time two minutes. Men to be kneeling in shelter trench or behind bank or rock.

*b. A vanishing target, size and shape of a man's head and shoulders.

To appear for seven seconds and disappear for seven seconds five times.

*c. A moving target. A khâki target with figure of a man in white on it.

Target about 5 feet high and 3 feet broad, the figure to be crouching to represent a man running from one rock to another. Length of run about 45 feet. Rate 5 or 6 miles an hour or according to proficiency of the men.

*d. Advancing target. Same target with figure facing firing point. Could be made to tumble over or vanish into a sloping trench.

*e. Same but retiring.

*f. Target moving diagonally.

g. Surprise targets appearing to the right, left, or rear of firer.

*h. Firing at a small group of targets painted to represent a general and a few staff officers, some mounted and some on foot, or cavalry or infantry scouts. Distance 1,000—1,200 yards, or even greater distances.

i. Firing up or down a steep hill at various objects.

j. Arranging rests for night firing on walls, sangars, forked sticks, and firing.

k. Firing by aid of star shells and rockets if Royal Artillery battery can co-operate.

It is important that firing should be sometimes with the bayonet fixed and sometimes without it, as fixing the bayonet much affects the trajectory.

All these practices can be varied as regards the distances, number of rounds, position of firers, etc.

Collective Practices.—As a rule these should be by sections, but may be by companies or half companies. Long-range volleys, for instance, would probably be more effective by companies.

a. Long-range volleys. Targets should be an area marked out on the ground and covered with canvas or the top of an old tent to represent a quarter column, etc.

*b. Vanishing target practice. As many figures (heads or heads and shoulders) as available.

*c. Moving target practice.

*d. Advancing target practice.

*e. Retiring target practice.

These could be done on the range, would be more realistic if done in the open, the target being worked by a pulley and long rope as is done by a battery.

*f. Section volleys at 900, 800, 600 yards. The company to advance at the double from 1,000 yards in extended order, and double between distances. To be timed according to rounds allotted and the ground.

*g. All the practices of the present table B, only executed practically, that is, the company doubling up and opening fire at once, or digging a shelter trench or making sangars or breastworks and firing as if on the defensive.

h. Attack practice.

i. Company field. Can be worked as a company in attack, or defence, or moving as a flank guard.

j. Company as leading portion of advanced guard piquetting of heights occupied by an enemy on flanks of line of march. Target heads or heads and shoulders at unknown distances.

k. Company having furnished a certain number of night piquets, retiring on to rear guard in the morning in face of active opposition.

l. Company, as portion of the advanced guard arrived intact in camp, detailed to furnish piquets, construct sangars, head cover, etc. Defence of sangars attacked by enemy.

m. Company as portion of a force making a frontal attack supporting another company moving up a parallel spur, or portions of the same company moving up parallel spurs.

n. Company retiring from a position. Protection by mutual fire, successive positions, etc.

o. Company on convoy duty, passing through a defile, attacked on one flank and ordered to support the flanking piquets.

p. Company in camp ordered to fall in on its alarm post on the perimeter and fire on the enemy observed to be advancing in masses. Long-range volleys, volleys or independent.

q. Company as escort to foraging party, retiring on camp followed up by enemy. Targets could be placed in position on the line of retirement after the company has proceeded to the appointed place for the convoy to load up.

r. Company posted on height for protection of defile, bridge, etc.

Attention is invited to the appendix containing the report on the practical course carried out by the Guides in 1898-99, published at pages 98-107 of the annual report on Musketry Instruction in India for 1898-99.

Cheap and effective head targets can be made from wire off bhoosa bales and wine boxes by twisting it round to the size of a man's head and covering the surface with paper, leaving enough of the ends to stick in the ground. A man can carry several of these.

A report of the course executed is to be rendered by each regiment in manuscript, each practice being carefully described in all particulars. The reports are to be forwarded to Army Headquarters with your remarks.

The course already executed by any companies of the regiments selected for this practical course will hold good, the practical course being done by the remaining companies.

It would add very much to the practical instruction if a regiment—or a double company at a time—could be moved into camp for a few days to carry out company training on unknown ground and combine it with the practical course of musketry herein referred to.

Laying out the targets for this course may take some little time, but the actual execution of the practices will probably take less time than is usually spent on the range at the ordinary course, and by combining musketry with some simple tactical ideas as suggested, and allowing officers to invent their own schemes and freeing them as far as possible from the monotony and irksomeness of range practice, it is hoped that all ranks will be able to take an even keener interest in their musketry than hitherto, and have the satisfaction of feeling that they are making a considerable advance in practical instruction.—*Pioneer Mail.*

AUSTRIA-HUNGARY.—The details of the War Budget for 1901 are as follows, viz. :—The ordinary credits amount to 278,649,953 florins, and the extraordinary to 251,685,528 (the florin being worth about two shillings). The question of the new artillery armament is clearly indicated in the latter amount, where a credit of 1,500,000 florins is mentioned for the continuation of experiments to be made for the laying down of a new system of field and mountain guns. This is 1,420,000 florins more than the preceding year's extraordinary credits ; the reason assigned for the increase being " the advanced condition of these experiments, which render a more searching trial of the new models indispensable."

There is also a large credit of 2,000,000 florins for fortified works in the Extra-Ordinary Budget, but the Minister of War reserves to himself the right to justify this expenditure in Parliament by word of mouth.

The 1901 Budget contains a credit of 3,400,000 florins for the armament of certain fortified places and for the increase of ammunition for guns in existing fortresses ; three more millions for the purchase of small arms and ammunition,

and 1,000,000 florins for smokeless powder for siege park guns; 150,000 florins for replacing old shell fuzes by those of a new model, also 149,500 florins as the first annual instalment of a credit for the purchase of material for the military train, and for the harness and horsing of the same; 595,000 florins for the purchase or alteration of various articles of equipment in consequence of the adoption of a new repeating rifle for the different branches of the Service; 70,000 florins to complete the telegraphic network of the fortifications; and finally 2,100,000 florins for the purchase and organisation of musketry camps and manœuvre grounds. Such are pretty well the total of the credits of the Extra-Ordinary Budget.

With regard to the Ordinary Budget, the following are the principal items, viz.:—

	Florins.
Central Administration	974,683
Military, Local, and Territorial Commands	3,406,175
Commissariat	2,532,530
Military Charities	390,166
Military Jurisdiction	770,265
Higher Commands and Staff	4,934,526
General Maintenance of Troops..	67,971,994
Establishments for Military Instruction	3,824,884
Technical Military Committee	201,738
Provision Warehouses	1,558,542
Bedding Warehouses	94,910
Technical Artillery...	9,406,757
Depôt for Military Train Matériel	197,881
,, Pioneer ,, ...	298,252
Military Buildings	8,720,804
Military Geographical Institution	546,426
Medical Department	8,732,740
Maintenance of Troops	25,003,402
Military Prisons	206,796
Provisions	38,375,384
Various Expenditure	1,053,429
Food for Men	28,731,640
Remounts	6,418,559
Gratuities to N.C.O.'s	5,320,000

These, with a few items of secondary importance, amount to a grand total of 278,649,953 florins. As regards Q.F. guns, experiments have been actively carried on, but on a very modest scale, during the past year. In any case the report that the adoption of a new Q.F. gun will be made in 1901 may be considered as premature. What has given rise to this report is the greater urgency of a request to the delegates for a credit for Q.F. guns for field artillery, but this is only wanted in order to conduct experiments with regard to them on a far larger scale than hitherto.

The Minister of War has just taken steps to facilitate the mounting of captains of infantry and of artillery by giving up to them, free of cost, cast horses from the military train that are still fit for service. These horses remain the property of the State and are simply placed at the disposal of corps commands to remount their captains. When one of these animals becomes unserviceable, the corps commander has merely to order it to be sold. On the other hand, if one of these horses is available, the corps commander can himself order it to be handed over to another captain of the regiment, or to another corps in his command. Captains to whom these animals are lent may buy them in at any time at a certain fixed price, which is at the present time 80 florins. —*Précis from Le Progrès Militaire.*

FRANCE.—An article in the *France Militaire* gives some interesting details concerning the armament of the cavalry of the different European nations. The writer quotes the views of a French general of cavalry, who is greatly opposed to the introduction of the lance into the French cavalry, as follows :—

"All the English cavalry, viz., 31 regiments, are armed with the sword and Lee-Metford carbine; the 7 dragoon regiments have lately received the lance for the first rank.

"In Italy 24 cavalry regiments have the sword and repeating carbine, to which latter a hinged bayonet about 30 inches long is fixed, which folds back, point downwards, on the carbine, and is kept in its place by a spring when not in use.

"The 42 regiments of Austrian cavalry are altogether armed with the repeating carbine and the sword. The 11 Uhlan regiments, which alone lately had the lance, have definitely abandoned it.

"In Germany the lance is in great favour—why, I will tell you later. There the 93 regiments of cavalry are all, without exception, armed with the lance, the sword, and a repeating carbine.

"The 119 regiments of Regular cavalry which Russia possesses are armed with the sword and a repeating carbine. The 58 Russian dragoon regiments have not got the lance, but their carbines have a bayonet about 13 inches long, which is in a wooden scabbard fixed close to that of the sword. Of the 53 Cossack regiments, 38 alone have the lance, and those only for the first rank. The 15 regiments of the Cossacks of the Caucasus have not got it. On the other hand, all Cossacks, without exception, in addition to the regular armament, carry a pistol or a dagger in their belts. Finally, the 6 Guard regiments, 4 cuirassier, and 2 Uhlan, have the lance, for the front rank only.

"Russia, then, a country where the lance is the traditional weapon, appears to be gradually giving it up. That is why this nation, realising that fire is of primary importance, relies more on the carbine and bayonet than on the lance.

"Thus Austria has altogether given up the lance, England and Italy allow it only for a portion of their cavalry, Germany alone retains it in all her regiments.

"I myself think it would be a very great fault to imitate Germany in this respect. She is blind to the disadvantages of the lance, by her exaggerated love for parade appearances.

"The great Russian military writers, experts one may say, on this subject have, after a long experience of the lance, forcibly exposed its various defects. It is, they say, illogical to arm differently the first and second ranks of a troop of cavalry, as the ranks must infallibly become mixed up in a charge.

"If the Cossacks of the Don still preserve the lance, it is only in consequence of the ancient traditions of troop leaders.

"This long arm, writes Dragomiroff, is only an encumbrance in hand-to-hand fighting. It is then useless against even a dagger, besides, when it breaks, as it frequently does, the soldier armed with the stump is completely at the mercy of the enemy rushing on him, sword in hand.

"Skobeleff himself does not write more favourably of it. He admits that in the pursuit the lance is superior to the sword, but, he adds, it requires a greater skill to handle, a skill which no Cossacks possess, with the exception of those of the Don, whose national weapon it is. He writes also that the lance, more than any other weapon, encumbers the horseman, whom it is especially important not to embarrass with weapons hung about him.

"A light Q.F. rifle, and a straight sword, with a point as well as an edge, to be used for thrusting as well as for cutting, are the proper weapons for all cavalry."

In a recent article in the *France Militaire* on the difference in strength between the French and German troops of communications, the new German regulation with regard to the troops for the lines of communication, has, it says, drawn attention to the French organisation. The so-called troops for communications consist in Germany of the railway, telegraph, and ballooning troops. They are all under the orders of a general officer, who is responsible for their instruction, and who is directly responsible to the Emperor.

The Railway Brigade consists of 3 regiments of 2 battalions of 4 companies each; to these must be added the Bavarian troops, forming a battalion of 3 companies; these combined make up a total of 180 officers and 4,500 men. The telegraph troops consist of 3 Prussian battalions, of which two have 3, and one has 2 companies, of 1 Saxon company and a Wurtemberg detachment, making up a total effective of 45 officers and 1,300 men. Finally, the balloonists are formed into 2 companies, with a total of 13 officers and 200 men. If the French organisation is looked into, it will be found that they possess only 1 railway regiment (the 5th Engineer Regiment) of 12 companies; in all, 60 officers and, at most, 1,200.

There are no telegraph troops in peace-time. In war-time the duties are performed by civilians in the post and telegraph offices, who are turned into military men on mobilisation.

The balloonists alone can be compared to the similar German troops, as each of the first 4 engineer regiments have a special company of balloonists, with a total strength of 12 officers and a maximum of 400 men. With this last exception, then, it is seen, that the French communication troops are greatly inferior, in point of numbers to those of their neighbours.

GERMANY.—By a decision of the 18th January, 1900, the Emperor has brought in certain changes in the regulations regarding staff rides in Germany. These rides, as formerly, come under three headings, viz.:—

1. General Staff rides.
2. Army Corps Staff rides.
3. Fortress Staff rides.

1. *General Staff Rides.*—This ride, under the supervision of the Chief of the General Staff of the Army, includes all officers of the General Staff. A certain number of regimental officers and officers belonging to the staffs of large units, as well as certain commissariat officials, continue to take part in them. But, whilst the duration of the exercise is fixed for twenty-one days, the date will in future be settled each year by the Chief of the General Staff.

2. *Army Corps Rides.*—In future *all* army corps will each year execute a staff ride, or a fortress staff ride. Hitherto this has not taken place in all army corps. In principle all officers of the District Staff, including those of fortified places, should take part in them. Exceptions should be as rare as possible. A commissariat official and regimental officers will take part in this ride. The number, rank, and branch of the Service of these officers are settled by the same regulations as formerly. The duration of the ride remains fixed for seventeen days.

3. *Fortress Staff Rides.*—Formerly, each year, a single army corps carried out this ride. In future, two army corps may be united for the same purpose. Thus, this year, the XIVth and XVth Army Corps will operate together at Strasburg.

The duration of this ride is increased from ten to twelve days.

COMPOSITION OF THE MANAGEMENT OF THE RIDE AND OF THE TWO SIDES.

a. Fortress Staff Ride of an Army Corps.

Officers taking part.	Management.	Attack.	Defence.
Chief of the Staff of the Army Corps...	1[1]	—	—
Staff Field Officer	1	1[2]	1[2]
Staff Captain	1	3	1
F.O. or Captain of Foot Artillery ...	1	1	1
Lieutenant of Foot Artillery	—	1	1
F.O. or Captain of Engineers	1	1	1
Lieutenant of Engineers	—	1	1
Captain or Lieutenant of Pioneers ...	—	1	—
Officer of the Railway Brigade ...	1	—	—
Infantry Captain	—	2	1
Infantry Lieutenant	—	—	1
Commissariat Official	1	—	—
Total	7	11	8

[1] Chief umpire.

[2] Commanders of sides.

To these must be added a professor from one of the military schools, and the heads of the medical and commissariat departments of the place, making altogether a total of 26, instead of, as formerly, 22, officers and some officials.

b. Fortress Staff Ride of two Army Corps.

The composition of the different groups is made on the same principle as above. The chief umpire or director is a general officer or one of the subordinate chiefs of the General Staff, helped by a certain, unfixed, number of staff officers, an officer of foot artillery, an engineer officer, and an officer from the Railway Brigade.

Each side is commanded by one of the chiefs of the staffs of the two army corps, aided by *all* the staff officers of the district of the army corps, by officers of the infantry, foot artillery, engineers, and a commissariat official. The attacking side is, in addition, given an officer of pioneers, and an officer of the Railway Brigade.

Heads of the local medical and commissariat departments, as well as a professor from a military school, also take part in the manœuvres.

It is interesting to observe the great preponderance of staff officers in the composition of the different sides.

After each of the staff rides the director furnishes a report on each of the officers and officials who take part in it. These reports are forwarded by the generals commanding the army corps to the inspecting officers, or to the authorities immediately connected with the officers reported upon. In addition to the instruction they afford, staff rides are particularly useful in gauging the worth of the officers, as well as their state of preparation for war from both a physical and intellectual point of view.—*Revue Militaire.*

In Germany the military schools offer extraordinary opportunities for the education of youth for a military life. There are several ways in which a youth may obtain a commission in the German Army. As a rule he first goes to what is known as the military preparatory schools. These schools are not open to all, but it is not difficult to obtain admission; sons of officers who cannot pay for a military education are allowed to attend free of charge, and to others the nominal sum of $200 a year is charged for tuition, clothing, and board. It does not follow that a youth who attends one of

these schools will enter the Army. When he has successfully passed through the highest class but one he receives a certificate which entitles him either to continue his military education or to enter a university and study literature and science as he may elect. If the young man desires to obtain a position in the Army of Germany he has two roads open to him after passing to the next higher class. If he remains at the school for a year longer and passes the examinations, which are by the way very severe, he is entitled to a commission. He has the option in place of this additional year of being assigned to a regiment as a non-commissioned officer, and at the end of six months of going to the War School for nine months' further study, after which he is examined, and. if successful, commissioned. This shows through what severe training the young man has to pass prior to obtaining the lowest commission in the Line.

To get into the general staff of the German Army an officer has to show that he has exceptional military ability, and is required to hand in an essay dealing with a question of purely military character. These essays are carefully gone over, first by the colonel of the regiment, who sends the best to the division commander, who in turn forwards the best to the commander of the army corps. It may be stated, as a general rule, that after an officer in the German Army has seen from four to five years' service he applies for admission to the staff. Two more special essays have to be written by the applicant upon subjects chosen for the occasion. One of these is upon a military subject, and the other upon a subject which would tend to show the writer's knowledge of current affairs. Each year about 800 officers apply for admission to the military academy, and of these only 133 are selected. After studying nine months at the military academy, a severe examination is given. The unsuccessful are returned to their old regiments, and those who have been so far successful are assigned temporarily to another regiment in another arm of the Service.

Thus officers of the infantry serve annually in the artillery for a few months, and officers of the cavalry go to the pioneers. After this service the successful officers return to the military academy for their second year's course, and again prepare for an examination, which weeds out many more. This process is repeated for the third time. Those officers who are successful during the three years are at the expiration of that time granted a year's leave, during which time they are expected to travel in another country and learn the language as well as the military systems employed there. At the expiration of the leave the officer returns to his own regiment, and after a year's service he is at last called to the general staff for temporary duty. Remaining in the staff a year, he returns to his regiment with the hope that he will be again called to the staff. Only one-third are called back the second time, and of these only about one-third remain permanently. Those selected for permanent duty in the staff of the German Army are commissioned as captains, but their promotion is exceedingly rapid. The general staff officers move within a very select circle—the brains of the Army, as it were. In due time every officer of the general staff returns to the front, with rank much higher than that held by his old contemporaries, and regains touch with the Line.

It will thus be seen how difficult it is for an officer to get a staff position, and how nearly impossible it is for men to be placed in that body through favouritism. No mediocre man can get upon the staff, and every member of the staff is kept in close touch with the Line of the Service.—*U.S. Army and Navy Journal.*

ITALY.—The Minister of War has just decided that on the 1st June next a muster of the whole of the effectives of the Italian Army, as regards men and horses, will be held. The following is a summary of the Minister's orders on the subject:—

The general muster will include all troops, that is to say, the carabiniers, regiments of all arms, brigades of coast and garrison artillery, as well as the companies of artillery artificers, the engineer railway brigade, the medical and

commissariat companies, the artillery and engineer practical school, the military academy, the military school, the practical medical school, the military colleges, the central infantry musketry school, the cavalry school, the reformatories, the military districts, and, lastly, the corps of pensioners and veterans.

All the military at present serving must take part in the muster with the exception of the sick, men in prison, men on guard, or on indispensable employ. But all the same, the horses of men who are away will be paraded. The men and horses who are absent from muster will have to be vouched for by a visit to the places where they may be.

Officers in close arrest or undergoing imprisonment in a fortress, as well as those on the sick list, will not be required to attend. Their corps commanders will answer for them. Men absent on the muster day, viz., on detachment, on the march, in hospital, on leave, etc., will be entered on the field state showing the causes of such absence.

In the principal places of a military district, one or more general officers, nominated by the army corps commander, will hold the muster. In other garrisons, if there are one or several regiments or depôts, the muster will be held by one general officer alone; if there are only battalions or detachments made up of several companies, the divisional commander will delegate that duty to the senior officer. If in certain army corps there is a paucity of general officers, the commander of the army corps may depute a field officer to take the muster.

The muster will be held on suitable ground, selected by the inspecting officer. The troops will be in full dress, the mounted branches being on foot. On the ground a table will be placed, on which the nominal rolls and materials for taking notes will be laid. The inspecting officer will be received with the compliments due to his rank. The nominal rolls, list of men absent, and the daily parade state, will be handed to him. The inspecting officer will cause the nominal rolls and the state to be checked by his staff officer accompanying him. As soon as the inspecting officer gives orders for the muster to commence, the regimental colour will be placed on his right, the companies in numerical order will advance successively to the table, at which the inspecting officer is seated, and each commander, halting six paces from him, will call the roll, according to rank, giving both Christian and surname of the officers, non-commissioned officers, and men, and with regard to those absent, will give the cause of their absence, stating where they are. Those present will file past the inspecting officer, the officers saluting with their swords, and the men replying "present," and keeping their rifles at the trail. The field officers' names will not be called, and they will not be required to file past the inspecting officer. The staff officer will tick off on the rolls the names of the men filing past, making any observations he may consider necessary for the information of the inspecting officer, when all the companies have filed past, and they will be massed and march past according to the regulations in force.

The muster of the horses and mules will be held after that of the men; time being given to the latter to get into drill order to fetch the horses. The latter will be placed in one rank with nothing but a snaffle-bridle. Commanders of units will call the roll of the horses, pointing out the registered number, the sex, the name, and the colour of the animal. Each horse must be halted for some seconds before the inspecting officer so that he may check the correctness of the roll. The muster finished, the inspecting officer will furnish a detailed report through the regular channel to the army corps commander, who will forward it to the Minister of War.—*La France Militaire.*

PORTUGAL.—The decree of the 7th September, 1899, with regard to the organisation of the Army, provided for the anticipated selection of units of all arms who should, from that time, hold themselves in immediate readiness for service in the Colonies for a period of 12 months. According to this document, in view of providing for all eventualities, the Minister of War must always hold at least one

battery of artillery, one squadron of cavalry, two companies of infantry, and the other branches of the Service in proportion, at the disposal of the Naval and Colonial Minister; that is to say, about 20 officers and 710 men in all.

In one of its last numbers the *Ordem do Exercito* publishes the text of a new decree, which bears date the 12th March, 1900, and which gives in detail the limitations regarding the formation, armament, *matériel*, and pay of these colonial detachments, of which the following are the most important.

Selection of Units and Cadres.

The units detached to the Colonies are selected in the artillery, cavalry, and infantry by the numerical order of the regiments, and in each regiment by the numerical order of battalions, companies, squadrons or batteries. The mountain artillery is on the same roster with the field, the horse artillery coming last. In the infantry the Chasseur regiments alternate with those of the Line, the 1st Chasseur Regiment taking the lead. In the engineers, companies are always taken according to the *rôle*, in numerical order. The selections remain in force for 18 months, after the lapse of that time it becomes the turn of the units following.

N.C.O.'s and men have to undergo a medical examination. Vacancies, if they exist, are filled in preference by Volunteers, or in default of the latter, by the youngest N.C.O.'s and men belonging to corps of the same branch of the Service quartered in the same district. Cadets in military schools, and soldiers authorised to finish a course of instruction in certain civil establishments, are excepted from this service. Each infantry battalion leaving for the Colonies receives, in addition to its ordinary complement, 2 subaltern officers, one to command a section of sappers, and the other to fulfil the duties of adjutant of the battalion. When an entire regiment quits the Peninsular, it leaves behind a depôt section, consisting of 1 subaltern, 3 sergeants, 6 corporals, and 9 men. It is the duty of this section to look after the barracks, the effects and the furniture left behind by the regiments.

Arms and Equipment.

The artillery and infantry are armed with the 6·5-millimetre carbine, model 1896, and carry the 1894 equipment, with the tente-abri; the old valise is, however, replaced by a smaller one.

Men are armed with the carbine and provided in the infantry with 120 cartridges. The artillery, cavalry, engineers, and the commissariat company only carry half that amount. Officers and men armed with the revolver are allowed 18 cartridges if on foot, and 30 if mounted.

The batteries carry 98 rounds. The reserve ammunition for each detachment is specially decided upon in each case.

Matériel and Tools.

All the units march with their bivouac materials; the infantry and cavalry carry, in addition, their entrenching tools. The detachments are further provided with carpenters' and saddlers' tools, with the various parts of the weapons, and with materials necessary for repairs. They are provided, as regards sanitary material—for infantry, 1 pair of cases for dressing wounds, 1 ambulance bag, and as many stretchers as there are companies; for the cavalry, 2 cases and 2 saddlebags for dressing wounds; for the artillery, 2 saddlebags and 1 stretcher; for the hospital orderlies, 1 hospital bag per man. A veterinary surgical case goes with each detachment. Bedding material is brought from the home country as required. A reserve of clothing and of small articles of equipment for each section is calculated on the following scale, viz.:—

Tunics, cloth trousers, and capes ...	5 per cent. of the effective.
Neckerchiefs	1 per man.
Pairs of boots and cord sandals ...	50 per cent. of the effective.
Police caps, vests, canvas trousers, shirts, drawers, handkerchiefs, and towels	25 per cent. of the effective.

This reserve may, if necessary, be further increased from the detachment stores. These stores issue, on arrival in the colonies, a felt hat to each officer, and a felt hat and 2 flannel shirts to each man.

Pay and Gratuities.

From the date of embarkation each officer is granted three times his rate of home pay; a bounty of 60,000 reis (about £13 15s.) a month to the commander of the expeditionary force, if he is not a general officer, and a bounty of 10,000 reis (about £2 5s.) a month to his adjutant. To the rank and file is given three times the rate of home pay and clothing allowance. To one and all is given field allowance for each day spent in the colonies, as well as travelling and subsistence allowances, the rate of which varies and is fixed by the governor of the colony. To this must be added the gratuities to which certain officers are entitled on account of their rank and employment, and the high pay given to re-engaged men.

Before departure a bounty is given to all leaving the country; it amounts to 100,000 reis (or £22 8s.) for the officers, 15,000 reis (£3 6s. 6d.) for non-commissioned officers, and 6,000 reis (£1 10s.) for the men.

Free transport is not given to the officers' and soldiers' families; special provision is, however, made for families the head of which dies in the colonies through wounds or sickness.

Messes.

In the field, N.C.O.'s and men mess together; when the troops are quartered at a station the N.C.O.'s live apart. In all cases the messes are formed according to circumstances and local resources. Sergeants contribute daily to the mess 95 reis (4¾d.) of their pay, 200 reis (10d.) of their field allowance, and 300 reis (1s. 3d.) of their subsistence allowance. Corporals and soldiers contribute 45 reis (2¼d.) of their pay, 200 reis (10d.) of their field allowance, and 200 reis (10d.) of their subsistence allowance. These high messing rates are based on the high prices of provisions and condiments which are not provided for in the field ration, and on the necessity of placing white troops in a position to resist the effects of the climate.—*Revue du Cercle Militaire.*

RUSSIA.—As is well known, the pay of Russian officers was divided into four allowance lists, viz.:—

1. Regular Pay.
2. Table Allowance.
3. Lodging Allowance.
4. Subsidiary Allowances.

Since June, 1899, however, this division has been altered, the subsidiary allowances having been suppressed, and the general total for each rank has been increased.

The following is the rate of regular pay for the different ranks:—

Ranks.	Normal Rate.	Increased Rate.[1]
Field-Marshal	Fixed by the	sovereign.
General	£224 0 0	£313 12 0
Lieut.-General	192 0 0	263 12 0
Major-General	160 0 0	213 16 0
Colonel	128 0 0	163 16 0
Lieut.-Colonel	115 4 0	143 8 0
1st Captain	96 0 0	115 4 0
2nd Captain	83 4 0	101 4 0
Lieutenant	76 16 0	93 8 0
Sub-Lieutenant	70 8 0	85 16 0
Ensign of Militia or Reserve	64 0 0	78 0 0

[1] The increased rate is given, in peace-time, to officers residing in places outside the Empire, to the permanent cadre of officers of the military schools for officers, and to pupils of the military academies.

The table allowance is fixed by the duties discharged by the officer. The lodging allowance varies, partly according to rank, and partly according to the list or grade to which the garrison, in which he may be quartered, belongs. There are eight of these grades or lists, and in giving the combined total of the three present allowances, viz., pay, table, and lodging allowance, it will suffice if the minimum combined total rate of pay and allowances of those in the garrisons of the 8th and the maximum combined total rate of pay and allowances of those belonging to garrisons of the 1st Grade, are quoted :—

Rank.	Minimum Rate for Garrisons of the 8th Grade.			Maximum Rate for Garrisons of the 1st Grade.		
	£	s.	d.	£	s.	d.
General of infantry or cavalry, commanding an army corps	885	8	0	1,041	8	0
Lieut.-General, commanding an army corps	842	12	0	960	0	0
Lieut.-General, commanding an infantry or cavalry division	682	12	0	800	0	0
Major-General, commanding an infantry, cavalry, or artillery battalions ...	480	0	0	554	12	0
Colonel, commanding a regiment... ...	442	12	0	501	8	0
Lieut.-Colonel, commanding a battalion...	308	4	0	367	0	0
,, ,, battery ...	227	4	0	275	4	0
Captain, commanding a company... ...	145	0	0	177	0	0
Lieutenant of a company	84	4	0	103	8	0
Sub-Lieutenant of a company	77	16	0	97	0	0

The total annual expenditure necessitated by this increase in the various rates of pay amounts to about £1,064,647.—*Revue Militaire.*

The Kirghiz, who are still mostly nomads at the present day, and who rove about the great Steppes to the North-East of the Caspian Sea, occupy themselves principally in horse-breeding. The poorest of them own from ten to twenty horses, while the richer ones possess from 8,000 to 10,000. The total number of Kirghiz horses may be, therefore, reckoned at several millions. This horse, still in a semi-wild state, springs from the Mongolian stock. He is, it is true, a small animal, seldom standing higher than 13.3 hands, but he is sturdily made, lively, and very handy. The neck is short, the withers high, the chest rather narrow but deep, the back level, or very slightly arched, the hind-quarters somewhat straight but the tail well set on. His colour is usually cream, roan, or chestnut. The Kirghiz horse is uncommonly hardy, and displays great endurance even with defective food. Through his dealings with the Russians, the Kirghiz has become far more careful in the treatment of his horse, and now takes precautions for the laying in of hay for the winter months, and puts up shelters for them against bad weather. The chief object of the Russians is to improve this breed as far as possible, for they anticipate a great future and a large export to Europe for the Kirghiz horse. Every year a considerable number of these animals are purchased as remounts for the Orenburg and Ural Cossacks.

The Calmucks, too, who roam about the Steppes to the North of the Caspian Sea, are great horse-breeders. Their horses, whose sires also came from the Mongolian stock, is not so smart in appearance as the Kirghiz, he is, however, larger, standing usually from 14.1 to 14.3, and sometimes even as high as 15.2 hands. The head is larger, and not well proportioned, the hind-quarters are, however, not so straight as in the Kirghiz animal; in other respects he has the same good qualities as the latter. From their intercourse with the Russians the Calmucks too have learnt to take greater care of their horses. Their herds furnish the chief remount source for the Cossacks of the Don.—*Deutsche Heeres-Zeitung.*

UNITED STATES.—One of the most comprehensive studies of our Army system that has been made of late by foreign military men has been concluded by Lieutenant Terruccio Vitale, of the Italian Army. The lieutenant was military attaché to the Italian Embassy at Washington during the Spanish war, and then went to Manila with the United States troops. Unfortunately he contracted a fever there, and was at the point of death at San Francisco, and later at New York. Consul-General Branchi at New York informs us that Lieutenant Vitale has partly recovered. He sailed some days ago for Italy. The Philadelphia *Call* recently published an interesting interview with the Italian officer. First Lieutenant Terruccio Vitale, of the general staff of the Italian Army, has spent over two years in this country and in the Philippine Islands for the purpose of studying the military system of the United States. He thinks our system of recruiting is far superior to the one in vogue abroad. "Your officers have the pick of men," he says. "while we must take what we can get. It follows, therefore, that physically and intellectually your recruits are far superior to those of any European Army; they are men who can be depended on to take the initiative under almost every circumstance; they need not, and do not, wait to have every little move ordered for them by their officers. How that works has been shown to me in the Philippines.

"The natural conditions of the territory between San Fernando and Porac are such that it was impossible to overlook the whole of the deploying line. But each man knew perfectly well what he should do, and while it was utterly out of the question to give commands to more than a few men at a time, the work these men did was simply marvellous, and, mind you, they were volunteers who had come from all walks of life; but such is their stability that they learn to be real, true, intelligent soldiers in a time which seems ridiculously short to an officer who has had to deal with the average European recruits. I went out with Colonel Bell, of the 36th Volunteer Regiment. We had a scouting party of about thirty men picked up at random from the ranks. Colonel Bell explained to these men what he wanted them to do, and every one of them acted in the most intelligent way. Regulars and Volunteers alike are simply a revelation to the foreign officer, who has experience in drilling and educating his men at home. It is no exaggeration to say that for the relatively small Army you have, your Army is the most efficient to be found anywhere. That is one of the advantages of a small Army; you can pick your men and bring it to a point of excellence which a large Army, recruited by general conscription, can never reach.

"The American officer is, above all, a most gentlemanly man, and in military science he is educated far better than his European brother officer. West Point is an ideal training school for an Army officer. They learn there every branch of the Service, and get an education that no European Army school gives to its students. Every officer, when he leaves the academy and begins his regimental duties, is more or less unaccustomed to them, but even herein you have the advantage over Europeans. You have a company of Regulars and some signalmen stationed at West Point, and the cadets learn something of the regimental life while pursuing their studies, while in Europe we join our regiments without having had anything to do with actual soldiers. The *esprit de corps* is cultivated in the academy and remains a solid bond between all officers, for they practically all come from the one school, no matter what branches of the Service they enter.

"What pleased me probably more than anything else was the sight of serving hot roast beef to the soldiers on the firing line out in the Philippine Islands, miles and miles away from the military depôts. The Commissary Department of your War Office has been criticised very harshly, but when you consider what it means to feed soldiers on the firing line with hot roast beef you will agree with me that is a feat which few Armies can boast of. All the time I have spent in the Philippine Islands I have lived and messed with the officers, have watched closely how the troops fared, and I must say that the Commissary Department did splendid work."

Lieutenant Vitale has prepared a very exhaustive report covering the whole of his observations for his Government.

The *Medical News* of 9th June has an article by Dr. Victor C. Vaughan, late major and division surgeon, U. S. V., giving conclusions reached after a study of typhoid fever among the American soldiers in 1898. It is an abstract of an oration delivered before the first annual meeting of the American Medical Association, held at Atlantic City, N. J., 5th-8th June, 1900. Dr. Vaughan, with Major Walter Reed, U. S. A., and Major E. O. Shakespere, U. S. V., composed a board appointed in 1898 to study the causes and spread of this fever in the national encampments. It is shown that every regiment both Volunteer and Regular, developed typhoid, and more than 90 per cent. of the Volunteer regiments developed typhoid within eight weeks after assembling in the State encampments. This was also true of most, if not all, the Regular regiments.

Typhoid fever not only appeared, but it became epidemic, both in the small encampments of not more than one regiment, and in the larger ones consisting of one or more corps. It appeared in camps in Northern as well as in Southern States, and there is no doubt that its prevalence was not due to the geographic location. It seems to be a general rule that in this country typhoid usually becomes prevalent in military expeditions within eight weeks after assembly. Its rapid appearance has also been noted in mining camps in various parts of the world.

As to the causes of typhoid, the board reached the conclusion that the miasmatic theory of its origin is not tenable. Locality was not responsible for the epidemic, and it could not be traced to poisons or miasma given off from the earth in a gaseous form. The pathogenic theory is also controverted, and the board was able to show that in every encampment the specific poison of typhoid fever was introduced, and with the fever as widespread as it is, probably several soldiers already infected enlisted in every command. It was without doubt spread by the transference of excretions of an infected individual to those not infected.

The greater likelihood of epidemic in camps than in civil life is due to the greater difficulty of disposing of human excretions, and its prevention in Armies is largely a question of the disposition of excretions. Camp pollution was the greatest sanitary sin committed in 1898, as at Chickamauga, where it is shown that some regiments were so situated that they received the drainage of others. Many commands were allowed to remain in one site too long, and requests for change in location made by medical officers were not always granted. In some cases regiments were improperly located by superior Line officers in the face of protests from medical officers.

As to remedies, Dr. Vaughan believes greater authority should be given to medical officers in matters relating to the hygiene of camps. Certain men of recognised ability should be selected as sanitary inspectors. Line officers in command failing to comply with requests made by a medical inspector, should state in writing the reason of non-compliance.

That the prevalence of typhoid varied with the methods of disposing of excretions, is illustrated by the methods of disposing of fecal matter in the three divisions of the 7th Army Corps. During a part of its stay at Miami, and during the entire period of its encampment at Jacksonville, water-carriage was employed for the disposal of fecal matter. In the Second Division the tub system was employed. By this method infected fecal matter was scattered all through the camp. In the Third Division regulation pits were used. The number of cases of typhoid fever was smallest in the First Division, and greatest in the Second Division. This indicates that the tub system is to be condemned, and the regulation pit system is not satisfactory in permanent camps, especially in hot

weather. On the march the pit system may be employed, but even there is a source of danger. The board has recommended that in permanent camps where water-carriage cannot be secured, all fecal matter should be disinfected and then carted away from camp. Galvanised iron troughs containing milk of lime should be used and removed daily.

Infected water did not prove an important factor in the spread of typhoid fever, but flies undoubtedly served as carriers of the infection. It is probable also that men carried infected material on their persons or clothing. A command changing location would carry infection with it, even after an ocean voyage. To get rid of serious infection change of location must be assisted by thorough disinfection of all clothing, bedding, and tentage. To prevent typhoid one command should not locate on a site recently vacated by another; beds should be raised from the ground, outer clothing should be removed at night when possible, and tents should not be overcrowded or placed too near together.

Among 44,803 officers and men of the 1st and 3rd Army Corps, the records of which were studied, the number of cases of typhoid fever was estimated at 9,660. This is equivalent to 21·56 per cent. In the 4th Army Corps the percentage seems to have been somewhat less. Of these cases more than half were not at first diagnosed as typhoid, and were not so considered until arrival at a hospital. This was due to the fact that the cases were not in the hands of regimental surgeons long enough for satisfactory diagnosis, as every sick man within forty-eight hours was sent to a division hospital, and from there many were at once furloughed home. The number of deaths in the 9,660 cases mentioned was 713, about 7½ per cent. The deaths from typhoid were more than 80 per cent. of the total deaths in the Service. This shows the need of improved sanitary arrangements for camps, even at a possible increase in the expense account.—*U.S. Army and Navy Journal.*

NAVAL AND MILITARY CALENDAR.

JUNE, 1900.

1st (F.) H.M.S. "Pyramus" commissioned at Chatham for Mediterranean.

" " H.M.S. "Edgar" arrived at Plymouth with relieved crews from China.

" " Severe fighting near Senekal by Sir L. Rundle's force; Lindley re-occupied. British casualties 30 killed, 150 wounded.

2nd (Sat.) H.M.S. "Goliath" left Plymouth for China with Destroyers "Coquette," "Cygnet," "Conflict," and "Hornet."

" " Sir C. Warren, with the Duke of Cambridge's Yeomanry, surrounded near Douglas by 1,000 rebels, whom he eventually beat off. British casualties 18 killed, 30 wounded.

" " Colonel Adye surprised and defeated a body of rebels at Khels, capturing their laager and flocks.

" " Draft 14th Hussars
" 17th Lancers
Detachment R.A.M.C.
Remounts Cavalry and R.H.A.
} Left England for South Africa in the "Nomadic."

" " 860 horses left Buenos Ayres for South Africa in the "Nyanza."

" " Draft 6th Dragoon Guards
" 5th Lancers
" Northumberland Fusiliers
" 2nd Bn. Cheshire Regiment
" 1st Bn. Highland L.I.
" Militia
Detachment R.A.M.C.
Remounts, Cavalry and R.A.
} Arrived at Cape Town from England in the "Pindari."

" " Draft 2nd Bn. Gloucester Regiment
" 9th Lancers
" 18th Hussars
" R.E.
Detachment R.A.M.C.
Remounts Cavalry and R.A.
} Arrived at Cape Town from Ireland in the "Mahratta."

4th (M.) Russian troops in China had an encounter with and defeated some "Boxers."

5th (T.) Lord Roberts occupied Pretoria after some sharp fighting, and released 150 British officers and 3,500 British soldiers who were prisoners there.

" " 13th Bn. Imperial Yeomanry were overpowered by the Boers near Lindley. Lord Methuen marched to their assistance, routed the enemy, but failed to release the Yeomanry.

" " The "Boxers" defeated the Chinese troops.

" " 670 horses left Buenos Ayres for South Africa in the "Royston Grange."

7th (Th.) Sir Redvers Buller turned the enemy's flank in Natal by occupying Van Wyke's Hill.

" " The 4th Bn. Derbyshire Regiment (Militia) was captured by the Boers at Roodeval, after heavy losses.

7th (Th.) 900 British Marines landed at Tientsin, and further reinforcements were asked for, to keep the line to Peking clear.

,, ,, Draft 1st Dragoons
,, 2nd Bn. Royal Warwick Regiment
,, Scottish Rifles
,, 2nd Bn. Yorkshire L.I.
Detachment R.A.M.C.
Remounts Cavalry and R.A.
} Left England for South Africa in the "Lake Erie."

8th (F.) H.M.S. "Powerful" and "Iphigenia" paid off at Portsmouth.

,, ,, Foreign Ministers in China demanded an audience with the Empress. Railway communication between Peking and Tientsin suspended.

,, ,, Royal Anglesey Engineer Militia
Royal Monmouth Engineer Militia
Draft 1st Bn. Liverpool Regiment
,, 1st Bn. Border Regiment
,, 2nd Bn. Dorset Regiment
,, 2nd Bn. Royal Highlanders
,, 1st Bn. Loyal North Lancashire Regiment
,, 2nd Bn. Northampton Regiment
,, 2nd Bn. Royal Berkshire Regiment
,, 1st Bn. Shropshire L.I.
,, 1st Bn. York and Lancaster Regiment
,, 1st Bn. Gordon Highlanders
,, 1st Bn. Royal Munster Fusiliers
,, 1st Bn. Rifle Brigade
Detachments R.A.M.C.
Details
} Left Ireland for South Africa in the "Aurania"

,, ,, Draft East Kent Regiment
,, Somerset L. I.
,, West Yorkshire Regiment
,, Yorkshire Regiment
,, 2nd Bn. Lancashire Fusiliers
,, South Lancashire Regiment
,, Welsh Regiment
R.A.M.C.
Details
} Left England S. Africa in the "Tagus."

9th (Sat.) The British lines of communication were cut at Roodeval by a force of 2,000 Boers with 6 guns.

,, ,, Draft 5th Dragoon Guards
,, Royal Inniskilling Fusiliers
,, Royal Engineers
,, Post Office Corps
Detachments R.A.M.C.
,, A.P.C.
Cavalry Remounts
} Arrived at Cape Town from England in the "Monteagle."

10th (S.) 2,000 Boers who had been operating in Botha's Pass, Natal, retired. British troops pursued and reached Gansvlei, thus turning the Laing's Nek position of the enemy.

,, ,, About 2,000 European troops, 915 of them being British, left Tientsin by train under Admiral Sir E. Seymour, to endeavour to force a way to Peking

10th (S.) Mounted Infantry Company
Draft 13th Hussars
,, 1st Bn. Suffolk Regiment
,, 2nd Bn. Seaforth Highlanders
Detachment R.A.M.C.
Remounts Cavalry and R.A.
} Arrived at Cape Town from England in the "Manchester Merchant."

,, ,, Imperial Yeomanry Base Depôt
Volunteer Drafts
Section Scottish National Hospital
Detachment Welsh Hospital
} Arrived at Cape Town from England in the "Avondale Castle."

11th (M.) H.M.S. "Pyramus" left Sheerness for Mediterranean.

,, ,, Lord Roberts attacked Commandant-General Botha outside Pretoria. The darkness prevented a British victory.

,, ,, Lord Methuen defeated De Wet at Rhenoster River and took his camp.

,, ,, Laing's Nek and Majuba evacuated by the Boers. Almond's Nek, the last defile to Charlestown Flats, was taken by the 2nd Dorsetshire Regiment at the point of the bayonet.

,, ,, 1,500 Boers surrendered to General Brabant in the Ficksburg District.

,, ,, The combined European force in China renched Lao-fa, 30 miles from Tientsin, and another train with 300 Russian and French troops left Tientsin. Advanced guard of the British marines had a skirmish with the "Boxers."

,, ,, In Ashanti the relief force, after defeating the enemy one day's march from Prah, was forced to halt owing to British losses.

,, ,, Draft 8th Hussars
,, Royal Scots
Detachment R.A.M.C.
} Arrived at Cape Town from England in the "Cavour."

,, ,, Draft 2nd Bn. Grenadier Guards
,, 3rd ,, ,,
,, 1st Bn. Coldstream Guards
,, 2nd ,, ,,
,, 1st Bn Scots Guards
,, 2nd ,, ,,
,, Royal West Surrey Regiment
Details
} Arrived at Cape Town from England in the "Britannic."

12th (T.) Launch of first-class armoured cruiser "Bayan" from La Seyne, Toulon, for Russian Government.

,, ,, The "Boxers" destroyed H.M. Minister's summer residence at Peking.

,, ,, Combined European force reached Lang-Fang, 40 miles from Peking.

,, ,, Draft 16th Lancers
,, R.A. (Artificers)
,, R.E. (Telegraphists)
,, Bedford Regiment
,, 1st Bn. Royal Irish Regiment
,, 2nd Bn. Gloucester Regiment
Detachment R.A.M.C.
Remounts Cavalry and R.A.
} Left England for South Africa in the "Montrose."

13th (W.) Chancellor of the Japanese Legation killed at Peking by Chinese soldiers.

14th (Th.) H.M.S. "Melpomene" arrived at Portsmouth from East India.

,, ,, Launch of battle-ship "Eidsvold" from Elswick for Norwegian Government.

14th (Th.) Communication with combined European force under Admiral Sir E. Seymour were cut between Tientsin and Peking.

,, ,, Draft 2nd Bn. Royal Fusiliers
,, 1st Bn. Leicestershire Regiment
,, 1st Bn. Royal Welsh Fusiliers
,, Worcester Regiment
,, 2nd Bn. East Surrey Regiment
,, 2nd Bn. Duke of Cornwall's L.I.
,, 1st Bn. South Stafford Regiment
,, 1st Bn. Essex Regiment
,, Derbyshire Regiment
,, King's Royal Rifle Corps
,, Manchester Regiment
,, Durham L.I.
,, 2nd Bn. Royal Irish Fusiliers
,, Argyll and Sutherl'd Highlanders
R.A.M.C.
Details
} Arrived at Cape Town from England in the "Kildonan Castle."

15th (F.) General Cronje surrendered Klerksdorp to Sir A. Hunter.

,, ,, The "Boxers" attacked the foreign legations at Peking.

16th (Sat.) Lieut.-General Baden-Powell occupied Rustenburg.

,, ,, Commandant-General Botha's burghers retired to Middleburg.

,, ,, No. 13 General Hospital
Yeomanry Hospital
Welsh Hospital
} Left England for South Africa in the "Saxon."

,, ,, Draft Somerset L.I. left England for South Africa in the "Tintagel Castle."

17th (S.) Combined European Fleets bombarded Taku North Forts, which were subsequently taken.

18th (M.) H.M.S. "Rattler" arrived at Plymouth from China.

,, ,, Tientsin cut off.

,, ,, The German Ambassador at Peking, Baron von Ketteler, was murdered by the Chinese.

,, ,, Laing's Nek tunnel repaired, and the first train passed through.

,, ,, Troops ordered from India to China.

,, ,, A.S.C.
Draft 10th Hussars
Draft Royal Artillery
Detachment R.A.M.C.
Remounts Cavalry and R.A.
} Arrived at Cape Town from England in the "Ottoman."

19th (T.) H.M.S. "Edgar" paid off at Devonport.

,, ,, Foreign Ministers were requested to leave Peking. They refused.

,, ,, Draft 19th Hussars
,, Norfolk Regiment
,, West Riding Regiment
Detachment R.A.M.C.
Remounts, Cavalry and R.A.
} Left England for South Africa in the "St. Andrew."

20th (W.) Krugersdorp captured by the British. Sir A. Hunter defeated De Wet, and General Hutton, with Mounted Infantry, captured two guns near Rustenburg.

,, ,, Lord Kitchener narrowly escaped capture by the Boers whilst in a train at Kopjes Siding.

21st (Th.) Tientsin bombarded by Chinese troops.

21st (Th.) Draft Royal Engineers
,, Somerset L.I.
,, 2nd Bn. East Yorkshire Regiment
,, North Stafford Regiment
,, 2nd Bn. Seaforth Highlanders
,, Royal Dnblin Fusiliers
Army Service Corps
Detachment No. 14 General Hospital
} Left England for South Africa in the "Orient."

22nd (F.) H.M.S. "Revenge" paid off at Chatham.

,, ,, Lord Dundonald and 3rd Cavalry Brigade occupied Standerton.

,, ,, Russian and American Relief Force ambuscaded near Tientsin. Losses very heavy.

23rd (Sat.) Tientsin relieved by combined European force under Russian General Stoessel. Admiral Sir E. Seymour, retiring on Tientsin, captured the Chinese arsenal 10 miles north of that town.

,, ,, Draft 2nd Dragoons
,, 6th Dragoons
,, Royal Lancaster Regiment
Detachment R.A.M.C.
Remounts, Cavalry and R.A.
} Left England for S. Africa in the "Pinemore."

24th (S.) Chinese Government issued edicts ordering the expulsion of all foreigners from China.

,, ,, 825 horses left Buenos Ayres for South Africa in the "Leitrim."

,, ,, Draft 14th Hussars
,, 17th Lancers
Detachment R.A.M.C.
Remounts, Cavalry and R.A.
} Arrived at Cape Town from England in the "Nomadic."

25th (M.) British, French, and German Legations were alone left standing in Peking.

,, ,, Wing of 7th Bengal Infantry
43rd Field Hospital
} Left Bombay for China in the "Nerbudda."

26th (T.) The combined European Force under Sir E. Seymour was relieved, and their casualties amounted to 62 killed and 312 wounded.

27th (W.) Launch of first-class armoured cruiser "La Gloire" at Lorient for French Navy.

,, ,, Allies captured Chinese arsenal north-east of Tientsin.

,, ,, Draft 12th Lancers
,, 1st Bn. Royal Sussex Regiment
Detachment No. 4 General Hospital
Remounts, Cavalry, R.A., and Mounted Infantry
} Left England for S. Africa in the "Templemore."

28th (Th.) H.M.S. "Bramble" and "Britomart" commissioned at Devonport for China.

,, ,, Launch of destroyer "Espingole" at Havre for French Navy.

,, ,, Draft 1st Bn. Northumberland Fusiliers
,, 2nd Bn. ,, ,,
,, Devonshire Regiment
,, 2nd Royal Scots Fusiliers
,, 2nd Bn. Hants Regiment.
,, 2nd Bn. Middlesex Regiment
,, Manchester Regiment
,, 1st Bn. Connaught Rangers
No. 14 General Hospital
} Left England for South Africa in the "Orotava."

28th	(Th.)	Draft 1st Bn. Lincoln Regiment ,, Cheshire Regiment ,, South Wales Borderers ,, King's Own Scottish Borderers ,, East Lancashire Regiment ,, 1st Bn. Oxford L.I. ,, 2nd Bn. Royal Highlanders ,, King's Royal Rifles ,, 2nd Bn. Wiltshire Regiment ,, 1st Bn. Cameron Highlanders ,, Leinster Regiment Detachment No. 14 General Hospital
		Left Ireland for S. Africa in the "Canada."
,,	,,	Royal Anglesey Engineer Militia Royal Monmouth Engineer Militia Draft 1st Bn. Liverpool Regiment ,, 1st Bn. Border Regiment ,, 2nd Bn. Dorset Regiment ,, 2nd Bn. Royal Highlanders ,, 1st Bn. Loyal North Lancashire Regiment ,, 2nd Bn. Northampton Regiment ,, 2nd Bn. Royal Berkshire Regiment ,, 1st Bn. Shropshire L.I. ,, 1st Bn. York and Lancaster Regt. ,, 1st Bn. Gordon Highlanders ,, 1st Bn. Royal Munster Fusiliers ,, 1st Bn. Rifle Brigade Detachment R.A.M.C.
		Arrived at Cape Town from Ireland in the "Aurania."
29th	(F.)	Draft East Kent Regiment ,, Somerset L.I. ,, West Yorkshire Regiment ,, Yorkshire Regiment ,, 2nd Bn. Lancashire Fusiliers ,, Welsh Regiment Detachment R.A.M.C. Details
		Arrived at Cape Town from England in the "Tagus."
30th	(Sat.)	Draft Royal Artillery ,, 2nd Bn. Royal West Kent Regiment Detachment No. 14 General Hospital Remounts
		Left England for S. Africa in the "British Princess."

FOREIGN PERIODICALS.

NAVAL.

ARGENTINE REPUBLIC.—*Boletín del Centro Naval.* Buenos Aires: May, 1900.—"Annual Report of the Directing Commission of the *Centro Naval*, 1899-1900." "How to Obtain and Keep the Subaltern *Personnel* of the Fleet, without having Recourse to Compulsory Service." "The New Japanese Destroyers." "Sir W. White's Opening Address as President of the Mechanical Section of the British Association" (*continued*). "The Preservation of Cordite." "The French Cruiser 'Cécille.'" "Naval Notes."

AUSTRIA-HUNGARY.—*Mittheilungen aus dem Gebiete des Seewesens.* No. 7. Pola: July, 1900.—"More Lighthouses." "The Logical Distribution of the Motive Power of War-Ships." "The Italian Naval Estimates for 1900-01." "The New Russian First-class Cruiser 'Askold.'" "Naval Notes."

BRAZIL.—*Revista Maritima Brazileira.* Rio de Janeiro: June, 1900.—"Riachuelo." "The Caravel of 1500 and the Cruiser of 1900." "A Practical Guide to the South Coast of Brazil" (*continued*). "The Chino-Japanese War from the Point of View of International Law" (*continued*).

FRANCE.—*Revue Maritime.* Paris: April, 1900.—"Brueys at Aboukir." "New Studies of Oceanic Chemistry." "Bizerta." "Reminiscences of the Past" (*continued*). "The Spanish-American War: Battle Orders of Admiral Sampson" "The Battle of Santiago." "The Naval War Game." "Naval Notes." "The Mercantile Marine."

May, 1900.—"A Study of Modern Battle-ships." "Notice on the Schools for Petty Officers." "Report on the Shipwreck Statistics for 1896." "A Criticism on the Forrster Method for Determining the Point of Altitude of Two Stars." "Maritime Defence of the Balearic Islands." "Naval Notes." "The Mercantile Marine."

Le Yacht. Paris: 2nd June, 1900.—"The Naval Schools." "Yachting Notes." 9th June.—"Submarine Boats of the 'Holland' Type." "Yachting Notes." "Steam Ice-Breakers." "The Three-Master 'Commandant Marchand.'" "New Instrument for Correcting the Compass." "French Navy League." 16th June.—"The Manœuvres of the Mediterranean and Channel Squadrons." "Yachting Notes." "The Yachtsman's Practical Manual." "The German Battle-ships: 'Kaiser Wilhelm' Type." "Steam Ice-Breakers" (*continued*). 23rd June.—"The Project of Naval Defence." "Yachting Notes." "The New Russian Cruiser 'Bayan.'" "The Naval Manœuvres." "Our Naval Forces in China." "Historical Notices of French Ships of War: The 'Algéciras'" (*continued.*) 30th June.—"The Naval Manœuvres" (*continued*). "Yachting Notes." "The New German Armoured Cruiser 'Fürst Bismarck.'"

Le Moniteur de la Flotte. Paris: 2nd June, 1900.—"The Semaphore Signalmen." "French Navy League." 9th June.—"The Crisis among the Mechanics." "The Report of M. Le Moigse." "The Navy in Parliament." "The Recruiting Mechanics." "Colonial News." 16th June.—"German Naval

Power." "The Navy in Parliament." "The Colonial Army." "Naval and Colonial Defence." 23rd June.—"The Crisis among the Mechanics." "Naval and Colonial Defence." "Re-organisation of the Heads of Different Branches of the Navy." "Affairs in China." 30th June.—"The Naval School." "Naval and Colonial Defence." "Affairs in China." "The Naval Manœuvres."

La Marine Française. Paris: June, 1900.—"Utilisation of the 'Inscrits Maritimes' for Coast Defence." "*À propos* of the Mercantile Marine: A Double Peril." "The Problem of the Naval Boiler in England" (*continued*).

GERMANY.—*Marine Rundschau.* Berlin: July, 1900.—"Law of the 14th June, 1900, regarding the German Fleet." "The Crossing into Alsen under the Great Elector on 14th December, 1648." "Studies on the Ram." "The Chronometer Observatory at Kiel." "Nordelbisch-Danish" (*continued*). "Naval Notes." "Inventions and Technical Matters."

ITALY.—*Rivista Marittima.* Rome: June, 1900.—"Submarine Navigation and its Scope in War." "Some Firing Exercises at Sea." "Incidents in the Spanish-American War."

PORTUGAL.—*Revista Portugueza, Colonial e Maritima.* Lisbon: June, 1900. – Have not yet been received.

SPAIN.—*Revista General de Marina.* Madrid: June, 1900.—"The *Points d'Appui* of the Fleet in their General Aspect" (*continued*). "A New Type of Ship of War." "Calculation of the Luminous Power of Lighthouses" (*continued*). "Some Statistics showing the State of the Spanish Mercantile Marine." "The Naval Babel." "Submarine Boats." "The Defence of Coasts." "Spanish Navy League."

MILITARY.

AUSTRIA-HUNGARY.—*Militär-Zeitung.* Vienna: 4th June, 1900.—"The Discussion of Delegates." "Officers' Military Employment Society." "Army Sport." 12th June.—"The Training of Infantry for the Attack." "Preparation of Captains." 20th June.—"Our War-Ships in China." "Meat Transport from the United States to Manila." 28th June.—"Nuptials of His Imperial Highness the Archduke Franz Ferdinand" "The Cadet Question." "The Entanglements in China." "Austrian Naval Contingent in China."

Miltheilungen über Gegenstände des Artillerie- und Genie-Wesens. Vienna: June, 1900.—"Law of Accidental Deviations." "Intelligence of the New Chinese Principles."

Organ der Militär-wissenschaftlichen Vereine. Vienna: May, 1900.—"Battle Formations." "Heavy Transport in War."

BELGIUM.—*Bulletin de la Presse et de la Bibliographie Militaires.* Brussels: 15th June, 1900.—"Practical Instruction of Troops and Cadres" (*continued*). "Practical Musketry Course" (*continued*). 30th June.—"Railways from a Military Point of View" (*continued*). "Practical Instruction for Troops and Cadres" (*continued*).

FRANCE.—*Revue du Cercle Militaire.* Paris: 2nd June, 1900.—"The Military Month." "Tactical Scheme" (with map and sketch). "French Artillery in Action." "The Transvaal War" (with sketch, *continued*). "Submarine Warfare" (with sketch, *continued*) "Foreign Opinion of Our Army." 9th June.—"The German Imperial Manœuvres in 1899" (with map). "The Transvaal War"

(*continued*). "Submarine Warfare" (with sketch, *continued*). "Our Alpine Troops Judged by the Spaniards." "Boers and English." 16th June.—"Tactical Scheme" (with map and sketch). "The German Imperial Manœuvres in 1899" (with sketch, *continued*). "The Transvaal War" (with sketch, *continued*). "Submarine Warfare" (with sketch, *continued*). 23rd June.—"Submarine Warfare" (*concluded*). "Portuguese Colonial Troops." "The German Imperial Manœuvres in 1899" (with sketch, *continued*). "The Transvaal War" (*continued*). 30th June.—"A Reserve of Algerian Sharpshooters."

Le Spectateur Militaire. Paris: 1st June, 1900.—"The Campaign of 1814." "From the Cape to the Zambesi" (2 sketches, *continued*). "The Trans-Sahara." "Column to Laos, 1887-1888" (*concluded*). "The Campaign of 1866" (*continued*). 15th June.—"The Campaign of 1814" (*continued*). "The Trans-Sahara" (*continued*). "The Command of a Squadron." "The Campaign of 1866" (*continued*).

Journal des Sciences Militaires. Paris: June, 1900.—"Fin de Siècle Promotion" (*concluded*). "The Striking-off of Bayonne as a Fortress." "The Centenary of Marengo—The *Rôle* of the Cavalry." "Q.F. Field Artillery in European Armies." "The Hague Conference and the New Rights of War." "Observations on the English Army in India in consequence of the Operations in 1897 on the Afghan Frontier." "Numbers in War." "Artillery Scouts." "The War of Succession in Austria, 1740-1748—The Campaign of Silesia, 1741-1742" (*continued*).

Revue d'Artillerie. Paris: June, 1900.—"Field Service Manœuvres by Battery Groups" (*continued*). "The Russian Range-finder, Mod. 1899." "Artillery according to the New German Field Service" "Cycle Curiosities—Petroleum Bicycles and Tandems."

Revue Militaire. Paris: June, 1900.—"The Spanish-American War" (*concluded*). "The New German Army Changes and the Imperial War Budget for 1900." "The Turkish Army in 1899." "The Campaigns of Marshal Saxe." "The Army of the North under Marshal Luckner, 19th May—11th July, 1792" (*continued*). "The War of 1870-71—Diary of the March and of the Operations of the Imperial Guard."

Revue du Génie Militaire. Paris: June, 1900.—"Various Attempts at Landing on the Coast of Brittany." "Analysis of and Extracts from Vauban's Correspondence" (*continued*). "Note on the Weekly Day of Rest for the Workmen Employed in the State Dockyards."

Revue de Cavalerie. Paris: June, 1900.—"The Russian Cavalry in the War of 1877-78" (with a map). "Sketch of Cavalry Tactics." "The Lessons of the 16th August" (*continued*). "Military Riding in the Eighteenth Century" (*concluded*). "The Publications of the Historic Section of the Staff of the Army—The Campaign of 1809 in Germany and in Austria." "Note on a 'Lever-Bit' Experimented on in the 21st Regiment of Dragoons."

GERMANY.—*Militär-Wochenblatt.* Berlin: 2nd June, 1900.—"Whitsuntide." "England and the Transvaal" (*continued*). "Officers Fencing." 6th June.—"The New Musketry Instruction of the Swiss Infantry." "Meat Transport from the United States to Manila." 9th June.—"Subsistence and Lodging during the Imperial Manœuvres." "England and the Transvaal" (*continued*). 13th June.—"The Marengo Campaign." "From the United States Secretary of War's Yearly Report for 1899." 16th June.—"In Remembrance of General of Infantry Moritz Kühne." "The Marengo Campaign" (*concluded*). "England and the Transvaal" (*continued*). 20th June.—"The Plinzner System and Soldiers' Equitation." "The Management of Artillery and Infantry Fire Discipline." 23rd June.—"Machine Guns on Service." "Nationality and Moral Value of the

English Troops in South Africa." "Italian Extra-Ordinary Army Budget.' 27th June.—"Experiences as Commander of a Cyclist Detachment in the two last Manœuvres." "England and the Transvaal" (*continued*). 30th June.—"Grand Duke Peter von Oldenburg and the Prussian Army." "Lessons of the South African War." "The Change in the French Generals' List in 1899."

Jahrbücher für die Deutsche Armee und Marine. Berlin: June, 1900.—"The 3rd Cavalry Division in the War of 1870-71" (*concluded*). "The South African War of 1899-1900." "Naval War and its Lessons." "The Italian Army and Navy Scheme in the second half of 1899." "The New Regulation for Service in the French General Staff." "The Military Strength of Ecuador."

Deutsche Heeres-Zeitung. Berlin: 2nd June, 1900.—"Alcohol in the Army." "Political and Military Position of the Dukedom of Prussia from 1675-1679" (*continued*). "From the South African Seat of War." 9th June.—"Four or Six Gun Batteries?" "Political and Military Position of the Dukedom of Prussia from 1675-1679" (*continued*). "The French Sahara Campaign" (*continued*). "From the South African Seat of War" (*continued*). 16th June.—"The Question of Fortifications in France." "Political and Military Position of the Dukedom of Prussia from 1675-1679" (*continued*). "The French Sahara Campaign" (*continued*). "From the South African Seat of War" (*continued*). 23rd June.—"The Latest Advance in Breech-loading Weapons." "Political and Military Position of the Dukedom of Prussia from 1675-1679" (*concluded*). "The French Sahara Campaign" (*continued*). "From the South African Seat of War" (*continued*). 30th June.—"The Vienna Derby." "The Latest Advance in Breech-loading Weapons" (*concluded*). "War-like Events in China." "The French Sahara Campaign" (*continued*). "From the South African Seat of War" (*continued*).

Internationale Revue über die gesammten Armeen und Flotten. Dresden: June, 1900.—"Military News from Argentine, Belgium, Brazil, Chili, China, Germany, and France." *10th Supplement.*—"Infantry Combat, and Questions opened up about it in Literature." "Russian Directions for Troops in Combat." *11th Supplement.*—"A Field Gun on Non-Recoil Carriage with Hydraulic Recoil fitted to Barrel." *French Supplement.*—"Construction of Railroad by German Railway Troops." "Can the Howitzer become the only Artillery Gun?" "Gunnery School for Field Artillery." "Operations of Moltke and of Napoleon." "New Field Artillery, Regulations, and Tactical Questions of the Day in that Branch of the Service." "The Spanish-American Naval War and the War Committee at Washington." "Resistance of Guns against Bursting."

Neue Militärische Blätter. Berlin: May, 1900.—"Preparation of our Reserve Officers." "Consideration of the New French Naval Construction." "Fortified Positions in the Light of Events in 1898 and 1899." "Naval Coalitions." "A Review of Small Arms in Our Time." "Pictures from the Life of the Old Prussian Army in Peace-time, 1763-1806" (*continued*).

June, 1900.—Has not yet been received.

RUSSIA.—*Voïénnyi Sbórnik.* June, 1900.—Has not yet been received.

SWITZERLAND.—*Revue Militaire Suisse.* Lausanne: June, 1900.—"The Passage of the St. Bernard in 1800." "Automatic Pistols" (*concluded*). "Shooting at 2,500 Metres with the Rifle, Model 89." "Commissariat Detachment at the Manœuvres of the Ist Army Corps in 1899."

NOTICES OF BOOKS.

The Wars of the Nineties: A History of the Warfare of the last Ten Years of the Century. London: Messrs. Cassell & Co., Ltd. 1900.

Centuries have somewhat the fashion of closing in wars, and assuredly the one now fast drawing to its close is no exception to the rule. Beyond having to take our share with the rest of Europe in the suppression of "the Yellow Peril" in the Far East, we have also on our hands the largest and most important war the country has ever been called upon to undertake, to say nothing of the crushing of a formidable rising in West Africa. War is in the air, and the issue of Messrs. Cassell & Co.'s publication—the authorship of the work is not made public—comes therefore at a peculiarly opportune moment. The book, of course, makes no attempt to describe the series of events now engrossing public attention, but deals only with the important campaigns that have occurred during the last decade, prior to those on which we are now engaged. They comprise the story of the reconquest of the Soudan; that of the Spanish-American War; our campaigns against the Pathan in Chitral and on the North-West Frontier of India; the story of the great conflict between the two rival Empires in the Far East, China and Japan; and, lastly, the story of the Græco-Turkish War. To treat the campaigns above-named fully, either from the historical or strategical point of view, would require far more space than the author has had at his disposal. Wisely, no attempt has been made at any more than an accurately told and interesting story of each campaign, and in every case the success has been complete. The book has been written, not for the military student, but for the man in the street, and to him it will prove both interesting and instructive. In the case of each campaign, the method of treatment includes an introductory portion, giving briefly the historical conditions that led to the outbreak of the conflict, and then some estimate of the military force of the combatants engaged, as well as, in conclusion, a setting forth of the situation in which the close of the war left the combatants. The wars are therefore treated not only from a military, but from a political and historical standpoint as well. Finally, the book is most admirably and profusely illustrated, and, what is so essential in following the story of a campaign, there are excellent maps. We can congratulate both author and publishers on the work.

History of the Oxfordshire Regiment of Militia, 1778-1900. Regimental Records. By Lieut.-Colonel FRANK WILLAN, 4th Bn. Oxfordshire Light Infantry. 8vo. Oxford, 1900.

Manuel des Candidats de toutes Armes aux différents Grades d'Officier. France. Army. Crown 8vo. Paris, 1900.

Les Bateaux Sous-Marins. By Messrs. F. FOREST and H. NOALHAT. 8vo. Paris, 1900.

The New Battle of Dorking. ANON. 8vo. London, 1900.

General John Jacob. By A. INNES SHAND. 8vo. London, 1900.

The Voyage of Robert Dudley to the West Indies, 1594-1595. HAKLUYT SOCIETY. 8vo. London, 1899.

The Journey of William Rubruck to the Eastern Parts of the World, 1253-55. HAKLUYT SOCIETY. Second Series No. IV. 8vo. London, 1900.

The Two Hundred and Fifty-ninth Annual Record of the Ancient and Honorable Artillery Company of Massachusetts. United States Army Records. 8vo. Boston, 1898.

The Campaign of 1815. By W. O'CONNOR MORRIS. 8vo. London, 1900.

Histoire de l'Armée d'Italie, 1796-1797. Campaigns. Two vols. 8vo. Paris, 1900.

Journal of a Member of the Expedition sent for the Delivery of Captives in Morocco. ANON. Crown 8vo. 1704.

Sièges (1748-1836). By ALBÉRIC NETON. 8vo. Paris, 1900.

Military Instructions for Officers Detached in the Field. ANON. Crown 8vo. London, 1779.

The Soldier's Companion. ANON. 42nd edition. Pamphlet. London, 1805.

Extract of Orders by H.R.H. the Duke of York. Army. 8vo. London, 1757.

The Decline and Fall of Napoleon. By Lord WOLSELEY. Crown 8vo. London, 1895.

The Further Training and Employment of Mounted Infantry and Yeomanry. By Major-General H. HALLAM PARR. Crown 8vo. Aldershot, 1900.

Les Flottes de Combat Étrangères en 1900. By Commandant DE BALINCOURT. Demy oblong 8vo. Paris, 1900.

Le Transsaharien par le Main-d'œuvre Militaire. By E. L. BONNEFON. 8vo. Paris, 1900.

Essai Historique sur la Tactique de la Cavalerie. 8vo. By Commandant GÉRÔME. Paris, 1900.

Organisation de l'Armée Austro-Hongroise (Mai, 1900). By Capitaine DEBAINS. 8vo. Paris, 1900.

Campagne de 1809 en Allemagne et en Autriche. By Commandant SASKI. 8vo. Paris, 1900.

L'Alsace en 1814. By A. CHUQUET. 8vo. Paris, 1900.

The China-Japan War. By VLADIMIR. 8vo. London, 1896.

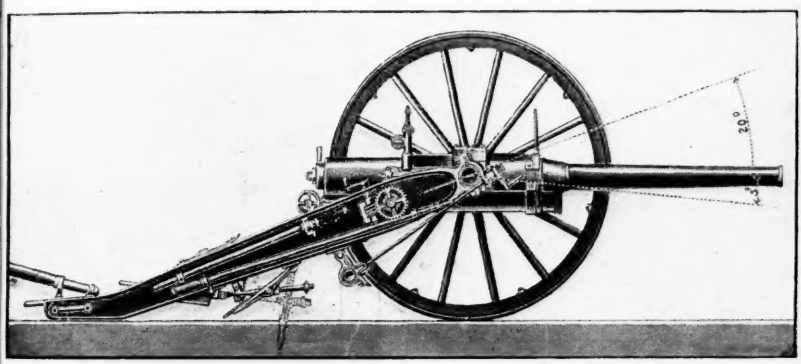

Fig. 1.

CREUSOT 3-INCH RAPID-FIRE GUN.

(Elevation of the gun, showing one wheel removed.)

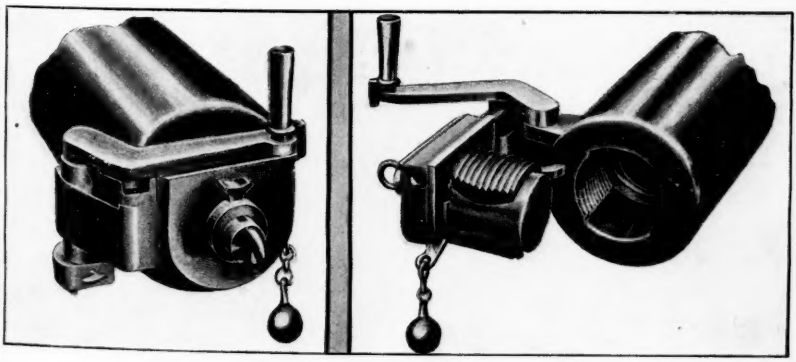

Fig. 2.
Breech Closed.

Fig. 3.
Breech Open.

(For Description see Military Notes.)

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